

Working Paper 1.A.
July 29, 2008

Georges Bank Atlantic Cod Assessment for 2008

by

**Loretta O'Brien , Nina Shepherd, Michele Traver,
Jiashen Tang, and Betty Holmes
NEFSC**

**Groundfish Assessment Review Meeting
Woods Hole, MA**

August 4-8, 2008

This information is distributed solely for the purpose of pre-dissemination peer review under applicable information quality guidelines. It has not been formally disseminated by NMFS. It does not represent and should not be construed to represent any agency determination or policy.

Background

This stock was last assessed and peer reviewed in August 2005 (O'Brien *et al.* 2006). The assessment was conducted using VPA with landings only, i.e. discards and recreational landings were not included in the catch at age. For terminal year 2004, total commercial landings were 4,583 mt and fully recruited F (ages 4-8, unweighted average) was estimated to be 0.24, the lowest F in the time series (1978-2004). Spawning stock biomass was 22,564 mt in 2004, 30% higher than the time series low in 1994. Since 1991, recruiting year classes had all been below the long term average (14 million age 1 fish) with the 2000 and 2001 year classes being the lowest in the time series. The 2003 year class, however, was estimated to be above average (21 million age 1 fish). The NEFSC spring and autumn bottom trawl survey indices continued to remain near record low values. The most recent above average autumn recruitment index of age 1 fish had occurred in 1988.

In 2002, biological reference points (BRPs) were developed for Georges Bank cod (NEFSC 2002) based on landings only, using a Beverton-Holt stock-recruit relationship with an assumed prior for the unfished recruitment as :

$$\begin{aligned} F_{MSY} &= 0.18, \\ MSY &= 35,200 \text{ mt and} \\ SSB_{MSY} &= 217,000 \text{ mt.} \end{aligned}$$

This assessment, with terminal year 2007, includes USA and Canadian commercial landings and discards, and USA recreational landings in the catch at age as recommended by the GARM II panel (Mayo and Terceiro 2005).

2.0 Fishery

Georges Bank Atlantic cod is a transboundary stock that is harvested by both USA and Canadian fishing fleets. USA cod landings are generally highest in the second calendar quarter (April-June) and are taken predominantly from the western part of Georges Bank (statistical areas (SA) 521-522, 525-526, 537-539, and Subarea 6) throughout the year (Figure A1). The majority of the landings from the eastern part of Georges Bank (SA 561-562) are taken in the first and second calendar quarter (January to June). USA landings are taken primarily by otter trawl gear and gill net gear. Since 1994, the Canadian fishery for Georges Bank cod has been open from June-December, and since 2005, June to the following February. Landings are taken primarily by long line and otter trawl.

Commercial Landings

Total commercial landings of GB cod taken by USA and Canadian fleets, and Distant Water Fleets (DWF) are available from 1893-2007 (Fig. A2a) and total catch is available from 1960-2007 (Table A1, Fig. A2b). USA commercial landings from 1994 to 2007 have been revised using the allocation scheme described at the GARM III data meeting. Total commercial landings of Georges Bank cod were 4,786 mt in 2007, a 26% increase

from 2005. The USA accounted for 77% of the total landings and Canada the remaining 23%.

Commercial Discards

Atlantic cod discarded in the USA Georges Bank otter trawl, gillnet, and scallop fisheries were estimated using the NEFSC Observer data from 1989-2007. A ratio of discarded cod to total kept of all species (d:k) was estimated on a trip basis. Total discards (mt) were estimated from the product of d:k and total commercial landings (Table A2). Discards at age were estimated annually by applying combined survey and commercial age-length keys to observer length frequency data. Estimates of discards from 1978-1988 were hindcasted using a survey filter method (O'Brien and Esteves 2001, Mayo *et al.* 1992, see GARM III BRP WP 4.5). Canadian discards from groundfish and scallop fisheries were estimated from 1997-2007.

In 2007, the USA fishery discarded 1,040 mt and the Canadian scallop fleet discarded 124 mt. There were no discards in the Canadian 2007 groundfish fishery due to 100% observer coverage. Discards accounted for 28% of total USA catch and 10% of total Canadian catch in 2007 (Table A1, Fig. A2b).

Recreational Landings

USA recreational landings of Georges Bank cod were re-estimated using revised data provided by NOAA MRFSS from 1981-2007 (Table A3). The number of length samples taken in the recreational fishery is insufficient to be used in estimating the landings at age, however, a review of available samples indicated a length range similar to that in the NEFSC survey. A combined commercial and survey age-length key, and autumn survey length frequencies were applied to number of fish landed to obtain the landings at age. Recreational landings represent between 2-15% of the total USA catch of cod during 1981-2007. In 2007, recreational landings represented 0.17% of the total USA cod catch (Table A1, Fig A2b).

Total Catch

Total combined USA and Canadian catch of Georges Bank cod was 5,957 mt in 2007, a 29% increase from 4,411 mt caught in 2006. USA catches accounted for 79% and Canadian catches accounted for 21% of the total catch. Total discards accounted for 20% of the catch (Table A1, Figure A2b).

Sampling intensity

The numbers of samples taken to characterize the length and age composition of the USA and Canadian commercial cod landings from Georges Bank are summarized in Tables A4 and A5. In the USA fishery, sampling intensity has been relatively high since 2003, ranging between one sample per 7 mt to 1 sample per 98 mt (Table A5). In the Canadian fishery, sampling since 2003 has ranged between one sample per 3 mt to one sample per 18 mt. The average number of fish measured per sample was 102 in the USA fishery and 283 in the Canadian fishery during 2007 (Table A5).

Catch at age

Numbers (000s), weight (mt), mean weight (kg) and mean length (cm) of fish, at age, for the USA commercial landings, USA commercial discards, USA recreational landings, Canadian commercial landings, and Canadian commercial discards at age are presented in Tables A6-A10. Total catch at age in numbers (000s), weight (mt), mean weight (kg), and mean length (cm) are presented in Table A11. USA landings at age for eastern GB (SA 561-562) and western GB (SA 521,522,525,526,537-539 and SubArea 6) were estimated separately for 1978-2007 (App. A. Table A1) and then combined as shown in Table A6.

3.0 Research Bottom Trawl Surveys

Biomass and abundance indices

NEFSC spring and autumn survey biomass and abundance indices generally declined from the mid-1970s to the mid-1990s. Since about 1990 the indices have fluctuated without trend and continue to remain below the long term average (Table A12, Fig. A4-A5). The DFO abundance indices show an overall decline since 1990 (Fig.A5)

Catch at age for NEFSC spring and autumn surveys and DFO spring survey are presented in Table A13-A15 and Fig.A6-A8.

The recruitment indices for age 1 from the NEFSC 2007 autumn bottom trawl survey indicate that the last above average year class occurred in 1988. The 1999, 2001, 2003, and 2005 year classes, although below average, are stronger than the very weak 2000, 2002, and 2004 year classes (Fig. A9). The Canadian 2008 spring survey indices of abundance indicate that the 2003 year class was above average as both one and two year old fish (Fig. A10).

Maturity ogives

Logistic regression analysis was used to estimate female maturity ogives from NEFSC spring research survey data for 1970- 2008. The number of samples taken each year, by sex, over the time series is not consistently high and does not allow for reliable annual estimates, so the data was smoothed by using a 5-year moving average. For example, the 1990 ogive was estimated by combining data from 1988-1992 and estimating one ogive, and then the 1991 ogive was estimated by combining data from 1989-1993 and so forth, for the time series. This means that the first year, 1970, only has three years of data (1970, 1971, and 1972) and the last year, 2007, has only 4 years of data (2005,2006, 2007 and 2008). Confidence limits for proportion mature at age were estimated at the 95% level using the approximate variance for large samples (Ashton 1972, O'Brien et al. 1993) and inverse 95% confidence limits for A_{50} (median age at maturity) were estimated within the SAS PROBIT procedure (SAS) (Figure A11).

Mean Length and Weight

Mean length and weight at age were estimated from the NEFSC autumn research bottom trawl surveys, 1970-2007. Mean weights at age were estimated using an historical length-weight equation prior to 1992. Annual length-weight parameters were estimated using data collected on autumn NEFSC surveys from 1992-2007. No trend is apparent in the younger ages, but ages 3-5 show a possible declining trend since the mid-1990s in both length and weight (Fig. A12). Length and weight trend together suggesting there is no change in condition for Georges Bank cod.

4.0 Assessment

In this VPA assessment, fully recruited F shifts from age 4, as seen in previous assessments, to fully recruited F at age 5. This is due, in part, to increases in minimum mesh size requirements to 6.5 inch square or diamond mesh that were invoked in May 2002. Prior to 2002, mesh requirements had been 6.5 inch square or 6.0 inch diamond mesh, since 1999.

VPA

Input data and Analyses

The ADAPT calibration method (Parrack 1986, Gavaris 1986, and Conser and Powers 1990) was used to derive estimates of instantaneous fishing mortality in 2007 and beginning year stock sizes in 2008. A conditional non-parametric bootstrap procedure (Efron 1982) was used to evaluate the precision of fishing mortality and spawning stock biomass. A retrospective analysis was performed for terminal year fishing mortality, spawning stock biomass, and age 1 recruitment.

The base ADAPT formulation provided stock size estimates for ages 1-8 in 2008 and corresponding F estimates for ages 1-7 in 2007. Assuming full recruitment at age 5, the F on age 9 in the terminal year was estimated as the average of the F on ages 5-8. The F on age 9 in all years prior to the terminal year was derived from weighted estimates of Z for ages 5-8. For all years, the F on age 9 was applied to the 10+ age group. Spawning stock size estimates were estimated with female maturity ogives (5-year moving window) derived from NEFSC spring research survey data for 1978- 2008 as described above.

The catch at age (Table A11) includes combined USA and Canadian landings and discards, and USA recreational landings from 1978-2007 (Tables A6-A10) for age 1-10+. The indices of abundance used to calibrate the VPA included the NEFSC 1978-2008 spring survey indices for ages 1-8 (Table A13), the NEFSC 1977-2006 autumn survey indices for ages 0-5 (Table A14) and the Canadian 1986-1992 and 1995-2007 spring survey indices for ages 1-8 (Table A15). The NEFSC spring survey was dis-aggregated into two series based on the use of the Yankee #36 or #41 trawls. The NEFSC employed the #41 trawl during 1973 to 1981. The spring indices were split into a series from 1978-1981 for the #41 trawl and a series from 1982-2005 for the #36 trawl. The autumn survey indices were shifted forward one age and one year to match cohorts in the spring

survey in the subsequent year.

VPA Diagnostics

The ADAPT calibration results for estimates of terminal year stock size and catchability (q) estimates, with corresponding standard error and coefficients of variation (CVs) are presented in Table A16. Stock size estimates were more precise for ages 2-8, (CVs ranging from 0.37 - 0.34) than for age1 (CV=0.48). Catchability estimates at age for the NEFSC spring and autumn surveys (Yankee #36 trawl) were similar with relatively low CVs (0.07-0.31), however, the spring survey (Yankee #41 trawl) was not as precise , particularly for ages 1, 7, and 8 (0.37-0.75). The precision of DFO (Division of Fisheries and Oceans, Canada) survey q estimates were similar to NEFSC spring and autumn surveys (Yankee #36 trawl), however, the q 's estimates were larger than 1 for ages 6-8. For all surveys, q increases with age and approaches a 'flat-top', with error bars overlapping for the older ages (Fig. A13).

The residuals (observed – predicted), presented in App.A Fig. A1. indicated a pattern of negative residuals in the early years of the time series and positive residuals in the latter part of the time series for age 3-7 in the NEFSC spring survey and for ages 4-8 in the DFO survey . The NEFSC autumn residuals show no persistent pattern (App.A Fig. A1).

VPA Assessment Results

Fully recruited fishing mortality (unweighted, ages 5-8) was estimated at 0.14 in 2007 (Table A17, Figure A14, App.A Table 2), a 52% decline from 2006, and the lowest F in the time series. Spawning stock biomass in 2007 was estimated at 25,312 mt, a 25% increase from 2006 (Table A17, Figure A15, App A Table A2). Recruitment (millions of age 1 fish) of the 2003 year class (13.6 million age 1 fish) is estimated to be similar to the 1998 year class (12.6 million age 1 fish) (Table A17, Fig.A15. App.A. Table A2). The 2002 year class (2.0 million age 1 fish) and the 2004 year class (3.0 million age 1 fish) and are the lowest in the time series. The last above average year class (1989) occurred almost 2 decades ago. Stock mean weights at age show no trend for ages 1-3, however, since about 1987 there appears to be an overall general decline in weight, with some fluctuation, for ages 4-8 (App. A. Fig. A2).

Precision of F and Stock Biomass Estimates

A conditional non-parametric bootstrap procedure (Efron 1982) was used to evaluate the uncertainty associated with the estimate of F and SSB from the final VPA. One thousand bootstrap iterations were performed to estimate standard errors, CVs, and bias for age 1-8 stock size estimates at the start of 2008 and age 1-10+ F estimates in 2007 (Table A18). The bootstrap results indicate that stock sizes were well estimated for ages 3-8 with CVs varying between 0.26-0.32., however, age 1(CV=0.73) and age 2 (CV=0.42) were not as well estimated. The fully recruited F for ages 5-8 was well estimated with CVs ranging between 0.17 and 0.29, with the exception of age 7 (CV=0.35). There is an 80% probability that the average F in 2007 is between 0.12 and 0.18 (Figure A16). There is an 80% probability that SSB in 2008 is between 32,152 mt and 45,879 mt ((Figure A16).

Back-calculated partial recruitment

Back-calculated partial recruitment (PR) at age from VPA was averaged over 3 time periods corresponding to changes in management: 1980-1993, 1994-2001, and 2002-2007. Within a time period, the PR was scaled to the highest averaged PR value at age. All three PRs vectors appear to be flat topped. The shift from fully recruited F on age 4 during 1980-1993 to age 5 during 1994-2001 and 2002-2007 is evident (Figure A17).

Retrospective Analysis

A retrospective analysis was performed to evaluate how well the current ADAPT calibration would have estimated F, SSB, and recruits at age 1 for seven years prior to the terminal year, 2007. Mohn's rho, calculated as the average of the 'tips' or terminal year values of each retrospective run, was calculated within each analysis.

There is a retrospective pattern of estimating F values lower than the terminal year F ($\rho = -0.49$) (Figure A18a) and a corresponding pattern of estimating higher values of SSB relative to the terminal year SSB ($\rho = 0.33$). The retrospective analysis in recruits at age 1 indicate that recruits are estimated at higher values relative to the terminal year ($\rho = 0.53$). There are three high estimates in 2002, 2003, and 2004 (Fig. A18c). The 2002 and 2004 are the lowest estimated year classes in the time series, and the 2003 year class is the largest estimated since 1991.

Sensitivity runs

Prior to selecting a final model, several sensitivity runs were conducted, although only two of these formulations are presented. The first VPA formulation was the same as the VPA described above, however, the survey abundance indices for each survey were split between 1994 and 1995. The second VPA formulation used a catch at age from 1 to 9, with no plus group. In addition to estimating stock size for ages 1-9 in the terminal year, the oldest age (9) was also estimated for the six years prior to the terminal year, to 2000. This formulation is referred to as 'around-the-corner' and is the same model formulation used by the Transboundary Resources Assessment Committees' (TRAC) Eastern GB cod assessment.

Split

Although no distinct mechanism (e.g. change in reporting and sampling systems, closed areas, life-history or environmental effect) is apparent as to why the surveys should be split in the mid-1990s, the result is a weaker retrospective pattern, as seen in some of the other GARM stocks (GB yellowtail flounder, witch flounder). There is a retrospective pattern of estimating F values lower than the terminal year F ($\rho = -0.14$), however, one year (2002) estimates a higher value than the TY (App. A. Fig. A3a). The SSB retrospective pattern has both higher and lower values compared to the TY year ($\rho = 0.13$, App. A. Fig. A3b). The retrospective pattern in recruits at age shows higher values relative to the terminal year ($\rho = 0.92$, App. A. Fig. A3c).

‘Around-the-corner’

The retrospective pattern of fishing mortality shows lower estimates relative to the terminal year ($\rho=0.25$), however, there are some extreme high values in the mid-1990s (App. A, Fig. A4a). SSB shows a retrospective pattern of both higher and lower values relative to the terminal year ($\rho=0.06$, App. A, Fig. A4b). The retrospective pattern in recruitment shows higher values relative to the TY in recent years ($\rho=0.51$), but a mixed pattern prior to 2003 (App. A, Fig. A4c).

A comparison of the two sensitivity runs and the base VPA is presented in Table A19. The Split VPA estimates lower stock size and higher F relative to the Base VPA. The Around the Corner VPA estimates higher stock size, particularly at older ages, and lower F on the older ages. The residual plots for ‘split’ and ‘around the corner’ are presented in App. A, Figs A5-A6.

5.0 Biological Reference Points

Yield per Recruit Analysis

A yield per recruit (YPR) analysis was conducted to provide an estimate of $F_{40\%}$ using the methods of Thompson and Bell (1934). Input data for catch and stock weights (ages 1-10+) were derived from an average of the most recent five years (2003-2007). The partial recruitment (PR) was based on a normalized arithmetic mean of 2003-2007 fishing mortality from the VPA and the maturity ogive was estimated as a 5 year moving average as described above for 2004-2008 (Table A20).

The estimated biological reference points of $F_{0.1}=0.22$, $F_{\max}=0.50$ and $F_{40\%}=0.25$ (Fig. A19) are higher than those estimated by the Working Group on Re-Evaluation of Biological Reference Points: $F_{0.1}=0.17$, $F_{\max}=0.33$, and $F_{40\%}=0.17$ (NEFSC 2002). Non-parametric estimates of MSY and SSB_{MSY} were derived from time series mean recruitment (14.3 million age 1 fish), Y/R (1.3592) and SSB/R (6.5116) as:

$$MSY = 19,454$$

$$SSB_{MSY} = 93,198.$$

Stochastic MSY estimates

The GARM III BRP Panel selected the non-parametric YPR analysis as the basis for the estimation of BRPs for Georges Bank Atlantic cod. Stochastic projections using the same input data as the YPR were run out to 100 years with $F_{MSY}=0.25$. Recruitment was estimated from a cumulative distribution function of 2008 VPA age 1 fish associated with $SSB > 50,000$ mt. The projection provided the following parametric biomass reference points:

$$F_{40\%}=0.25$$

$$MSY = 23,376 \text{ mt}$$

$$SSB_{MSY} = 139,934 \text{ mt.}$$

6.0 Projections

Short term, 2-year stochastic projections were performed to estimate landings and SSB during 2008-2009. The input values for mean catch and stock weights, PR, and maturity are the same as described above for the YPR analysis. Catch in 2008 was assumed equal to catch in 2007. The projections were run under three F scenarios : F_{07} , $F_{MSY}=F_{40\%}$, and Frebuild. The rebuilding plan for Georges Bank cod requires that the stock reach SSB_{MSY} by 2026. The Frebuild was estimated in a separate medium term projection out to 2026 using the same input data as above. Under an Frebuild = 0.249, the stock is projected to rebuild to $SSB_{MSY} = 139,934$ mt with a 50% probability by 2026.

The results of the short term projections, listed below, indicate that under Fstatus quo landings will decline in 2009 and SSB will increase . Under the F_{MSY} and Frebuild scenarios, which are essentially equal, both landings and SSB are projected to increase in 2009 relative to 2008.

| | Year | Catch mt | SSB mt | F |
|---------------------|------|--------------|-----------|-------|
| F status quo | | | | |
| 0.14 | 2007 | 5,957 | 25,312 | 0.14 |
| | 2008 | 5,957 | 30,508 | 0.23 |
| | 2009 | 4,107 | 35,081 | 0.14 |
| Fmsy | | | | |
| 0.25 | 2007 | 5,957 | 25,312 | 0.25 |
| | 2008 | 5,957 | 30,508 | 0.23 |
| | 2009 | 7,026 | 34,584 | 0.25 |
| Frebuild | | | | |
| 0.249 | 2007 | 5,957 | 25,312 | 0.14 |
| | 2008 | 5,957 | 30,508 | 0.23 |
| | 2009 | 7,001 | 34,589 | 0.249 |

7.0 Summary

The Georges Bank Atlantic cod stock is overfished but overfishing is not occurring (Fig. A20). Fishing mortality (unweighted, ages 5-8) in 2007 was estimated to be about 0.14, the lowest F in the time series. SSB was estimated at 25,312 mt in 2007, about 18% of SSB_{MSY} . The last year class that was above the time series average (14.3 million age 1 fish) occurred almost 2 decades ago in 1989. The 2003 year class (13.6 million age 1 fish) is near average and will be fully recruited to the fishery during 2008.

In this assessment, the VPA formulation was similar to previous assessments, however, fully recruited F shifted from ages 4-8 to ages 5-8, due in part to increases in mesh size since 2002.

Source of uncertainty include the estimation of discards, particularly those hindcasted from 1978-1988.

7.0 References

- Ashton, W. D. The logit transformation with special reference to its uses in bioassay. 88. 72. London, Griffin and Co.
- Conser, R.J. and J.E. Powers 1990. Extensions of the ADAPT VPA tuning method designed to facilitate assessment work on tuna and swordfish stocks. Int. Comm. Conserv. Atlantic Tunas. Coll. Vol .Sci. Pap. **32**: 461-467.
- Efron, B. 1982. The jackknife, the bootstrap and other resampling plans. Phila. Soc. Ind. and Appl. Math. **34**: 92 p.
- Gavaris, S. 1988. An adaptive framework for the estimation of population size. CAFSAC Res. Doc 88/29 12 p.
- Mayo, R. K., L.O'Brien, and N.Buxton. Discard Estimates of American plaice *Hippoglossoides platessoides* in the Gulf of Maine Northern shrimp fishery and the Gulf of Maine-Georges Bank Large-Mesh otter trawl fishery. Appendix to CRD-92-07 Res. Doc SAW 14/3 , 40 p. 92.
- Mayo, R.K. and M.Terceiro eds. 2005. Assessment of 19 Northeast groundfish stocks through 2004. 2005 Groundfish Assessment Review Meeting (2005 GARM), Northeast Fisheries Science Center, Woods Hole, Massachusetts, August 15-19,2005. Northeast Fisheries Science Center Reference Document. 05-13, 508 p.
- NEFSC 2002. 2002. Final Report of the Working Group on Re-Evaluation of Biological Reference Points for New England Groundfish. Northeast Fisheries Science Center Reference Document . 02-04 254 p.
- O'Brien, L. and C. Esteves 2001. Update Assessment of American plaice in the Gulf of Miane - Georges Bank Region for 2000. Northeast Fisheries Science Center Ref. Doc. 01-02 114.
- O'Brien, L., J. Burnett , and R. K. Mayo. 1993. Maturation of nineteen species of finfish off the northeast coast of the United States, 1985-1990. NOAA Tech. Report NMFS 113 66 p.
- O'Brien, L., N.Shepherd, and L. Col 2006. Assessment of the Georges Bank Atlantic cod stock for 2005. Northeast Fisheries Science Center Ref. Doc. 06-10 148 p.

Parrack, M.L. 1986. A method of analyzing catches and abundance indices from a fishery. Int. Comm. Conserv. Atlantic Tunas. Coll. Vol. Sci. Pap. **24**: 209-221.

SAS /STAT User's Guide . www.technion.ac.il/docs/sas/.

Thompson, W.F. and F.H Bell. 1934. Biological statistics of the Pacific halibut fishery. (2) effect of changes in intensity upon total yield and yield per unit of gear. Rep. Inter. Fish. Comm. No. **8**: 49 p.

Table A1. Commercial catch (metric tons, live) of Atlantic cod from the Georges Bank and South stock (NAFO Division 5Z and Subarea 6), 1960-2007.

| Year | USA | | | | Canada | | | | Country | | | | Total Landings | Total Catch |
|------|----------|----------|------|-----------|----------|----------|--------------|-------|---------|--------|-------|-------|----------------|-------------|
| | Landings | Discards | Rec. | Total USA | Landings | Discards | Total Canada | USSR | Spain | Poland | Other | | | |
| 1960 | 10834 | - | - | 10834 | 19 | - | 19 | - | - | - | - | - | 10853 | 10853 |
| 1961 | 14453 | - | - | 14453 | 223 | - | 223 | 55 | - | - | - | - | 14731 | 14731 |
| 1962 | 15637 | - | - | 15637 | 2404 | - | 2404 | 5302 | - | 143 | - | 23486 | 23486 | |
| 1963 | 14139 | - | - | 14139 | 7832 | - | 7832 | 5217 | - | - | 1 | 27189 | 27189 | |
| 1964 | 12325 | - | - | 12325 | 7108 | - | 7108 | 5428 | 18 | 48 | 238 | 25165 | 25165 | |
| 1965 | 11410 | - | - | 11410 | 10598 | - | 10598 | 14415 | 59 | 1851 | - | 38333 | 38333 | |
| 1966 | 11990 | - | - | 11990 | 15601 | - | 15601 | 16830 | 8375 | 269 | 69 | 53134 | 53134 | |
| 1967 | 13157 | - | - | 13157 | 8232 | - | 8232 | 511 | 14730 | - | 122 | 36752 | 36752 | |
| 1968 | 15279 | - | - | 15279 | 9127 | - | 9127 | 1459 | 14622 | 2611 | 38 | 43136 | 43136 | |
| 1969 | 16782 | - | - | 16782 | 5997 | - | 5997 | 646 | 13597 | 798 | 119 | 37939 | 37939 | |
| 1970 | 14899 | - | - | 14899 | 2583 | - | 2583 | 364 | 6874 | 784 | 148 | 25652 | 25652 | |
| 1971 | 16178 | - | - | 16178 | 2979 | - | 2979 | 1270 | 7460 | 256 | 36 | 28179 | 28179 | |
| 1972 | 13406 | - | - | 13406 | 2545 | - | 2545 | 1878 | 6704 | 271 | 255 | 25059 | 25059 | |
| 1973 | 16202 | - | - | 16202 | 3220 | - | 3220 | 2977 | 5980 | 430 | 114 | 28923 | 28923 | |
| 1974 | 18377 | - | - | 18377 | 1374 | - | 1374 | 476 | 6370 | 566 | 168 | 27331 | 27331 | |
| 1975 | 16017 | - | - | 16017 | 1847 | - | 1847 | 2403 | 4044 | 481 | 216 | 25008 | 25008 | |
| 1976 | 14906 | - | - | 14906 | 2328 | - | 2328 | 933 | 1633 | 90 | 36 | 19926 | 19926 | |
| 1977 | 21138 | - | - | 21138 | 6173 | - | 6173 | 54 | 2 | - | - | 27367 | 27367 | |
| 1978 | 26579 | 298 | - | 26877 | 8783 | - | 8783 | - | - | - | - | 35362 | 35659 | |
| 1979 | 32645 | 537 | - | 33182 | 5979 | - | 5979 | - | - | - | - | 38624 | 39161 | |
| 1980 | 40053 | 569 | - | 40622 | 8060 | - | 8060 | - | - | - | - | 48113 | 48682 | |
| 1981 | 33849 | 1033 | 4162 | 39043 | 8496 | - | 8496 | - | - | - | - | 42345 | 47539 | |
| 1982 | 39333 | 985 | 2955 | 43274 | 17816 | - | 17816 | - | - | - | - | 57149 | 61090 | |
| 1983 | 36756 | 656 | 3865 | 41277 | 12132 | - | 12132 | - | - | - | - | 48888 | 53409 | |
| 1984 | 32915 | 98 | 994 | 34007 | 5758 | - | 5758 | - | - | - | - | 38673 | 39765 | |
| 1985 | 26828 | 349 | 4678 | 31856 | 10442 | - | 10442 | - | - | - | - | 37270 | 42298 | |
| 1986 | 17490 | 457 | 425 | 18372 | 8503 | - | 8503 | - | - | - | - | 25993 | 26876 | |
| 1987 | 19035 | 266 | 970 | 20271 | 11842 | - | 11842 | - | - | - | - | 30877 | 32113 | |
| 1988 | 26310 | 323 | 2587 | 29220 | 12757 | - | 12757 | - | - | - | - | 39067 | 41977 | |
| 1989 | 25056 | 866 | 507 | 26429 | 7912 | - | 7912 | - | - | - | - | 32967 | 34340 | |
| 1990 | 28110 | 618 | 1339 | 30067 | 14345 | - | 14345 | - | - | - | - | 42455 | 44412 | |
| 1991 | 24219 | 476 | 657 | 25352 | 13457 | - | 13457 | - | - | - | - | 37676 | 38809 | |
| 1992 | 16899 | 766 | 350 | 18014 | 11669 | - | 11669 | - | - | - | - | 28569 | 29684 | |
| 1993 | 14590 | 376 | 1127 | 16093 | 8527 | - | 8527 | - | - | - | - | 23117 | 24620 | |
| 1994 | 9737 | 199 | 544 | 10479 | 5276 | - | 5276 | - | - | - | - | 15013 | 15755 | |
| 1995 | 7028 | 116 | 826 | 7970 | 1099 | - | 1099 | - | - | - | - | 8127 | 9069 | |
| 1996 | 7259 | 139 | 367 | 7765 | 1912 | 42 | 1954 | - | - | - | - | 9171 | 9719 | |
| 1997 | 7545 | 127 | 715 | 8388 | 2917 | 479 | 3396 | - | - | - | - | 10462 | 11785 | |
| 1998 | 7044 | 132 | 434 | 7609 | 1908 | 372 | 2280 | - | - | - | - | 8952 | 9889 | |
| 1999 | 8319 | 132 | 387 | 8839 | 1825 | 328 | 2153 | - | - | - | - | 10144 | 10992 | |
| 2000 | 7612 | 204 | 309 | 8125 | 1585 | 62 | 1647 | - | - | - | - | 9196 | 9772 | |
| 2001 | 10746 | 374 | 205 | 11325 | 2144 | 117 | 2261 | - | - | - | - | 12889 | 13586 | |
| 2002 | 9470 | 311 | 237 | 10018 | 1275 | 76 | 1351 | - | - | - | - | 10745 | 11369 | |
| 2003 | 6856 | 335 | 203 | 7394 | 1316 | 191 | 1507 | - | - | - | - | 8172 | 8901 | |
| 2004 | 3507 | 178 | 345 | 4029 | 2166 | 98 | 2263 | - | - | - | - | 5672 | 6293 | |
| 2005 | 2754 | 541 | 243 | 3538 | 630 | 233 | 863 | - | - | - | - | 3384 | 4401 | |
| 2006 | 2694 | 387 | 79 | 3159 | 1097 | 355 | 1452 | - | - | - | - | 3790 | 4611 | |
| 2007 | 3678 | 1040 | 8 | 4725 | 1,108 | 124 | 1232 | - | - | - | - | 4,786 | 5957 | |

Table A2. Discards of Atlantic cod in Georges Bank large mesh otter trawl and gill net fisheries, 1989-2007. Total includes discards from other gear.

| Year | GB large mesh trawl | | | GB gillnet trawl | | | Scallop | | | Total | |
|------|---------------------|------|---------|------------------|------|---------|---------|------|---------|--------|------|
| | mt | cv | # trips | mt | cv | # trips | mt | cv | # trips | mt | cv |
| 1989 | 730.0899 | 0.26 | 26 | 0 | 0 | 0 | 0 | 0 | 0 | 865.7 | 0.22 |
| 1990 | 524.9838 | 0.33 | 25 | 0 | 0 | 0 | 0 | 0 | 0 | 617.9 | 0.55 |
| 1991 | 425.0898 | 0.48 | 28 | 0 | 0 | 0 | 0 | 0 | 0 | 475.6 | 0.44 |
| 1992 | 270.63 | 0.48 | 29 | 0 | 0 | 0 | 0 | 0 | 0 | 765.6 | 0.25 |
| 1993 | 292.9039 | 0.29 | 25 | 0 | 0 | 0 | 0 | 0 | 0 | 375.9 | 0.23 |
| 1994 | 60.7842 | 0.41 | 25 | 76.1732 | 0.24 | 55 | 0 | 0 | 0 | 198.6 | 0.27 |
| 1995 | 54.66082 | 0.47 | 41 | 53.73666 | 0.35 | 86 | 0.4 | 0.68 | 0 | 115.7 | 0.29 |
| 1996 | 17.29 | 0.55 | 19 | 90.91845 | 0.85 | 88 | 27.3 | 0.50 | 14 | 139.0 | 0.47 |
| 1997 | 21.43163 | 0.29 | 27 | 75.29152 | 0.47 | 69 | 27.4 | 0.49 | 13 | 127.5 | 0.29 |
| 1998 | 11.00901 | 0.54 | 9 | 62.04998 | 0.00 | 194 | 49.5 | 0.43 | 17 | 131.5 | 0.40 |
| 1999 | 49.84209 | 0.48 | 20 | 43.28701 | 0.31 | 82 | 32.0 | 0.44 | 21 | 132.5 | 0.26 |
| 2000 | 110.8575 | 0.66 | 20 | 78.3508 | 0.33 | 168 | 4.2 | 0.15 | 26 | 204.1 | 0.38 |
| 2001 | 317.7702 | 0.64 | 33 | 39.33952 | 0.17 | 115 | 8.0 | 0.29 | 252 | 374.5 | 0.55 |
| 2002 | 84.59817 | 0.27 | 68 | 66.86346 | 0.24 | 52 | 5.4 | 0.42 | 16 | 311.4 | 0.26 |
| 2003 | 249.8549 | 0.28 | 147 | 45.08271 | 0.21 | 240 | 5.8 | 0.27 | 22 | 334.8 | 0.23 |
| 2004 | 113.6096 | 0.27 | 209 | 32.99943 | 0.16 | 451 | 1.0 | 0.33 | 23 | 178.1 | 0.19 |
| 2005 | 478.0872 | 0.12 | 702 | 5.66546 | 0.11 | 168 | 2.9 | 0.32 | 80 | 541.4 | 0.11 |
| 2006 | 334.9372 | 0.19 | 363 | 10.79936 | 0.13 | 217 | 6.4 | 0.17 | 80 | 386.9 | 0.32 |
| 2007 | 953.2067 | 0.15 | 370 | 16.00482 | 0.14 | 423 | 5.4 | 0.22 | 110 | 1039.6 | 0.15 |

Table A3. Estimated numbers (000s) and weight (mt,live) of Atlantic cod caught by marine recreational fishers from the Georges Bank and South stock during 1981-2007. The data has been revised by MRFSS since GARM II and includes new site registers.

| Year | Catch | | Landed | |
|------|-----------------|---------------|-----------------|---------------|
| | Numbers 000s | Weight* mt | Numbers 000s | Weight* mt |
| 1981 | 1740.5 | 3841.4 | 1684.4 | 3717.6 |
| 1982 | 1548.2 | 6820.1 | 1495.1 | 6586.1 |
| 1983 | 1839.8 | 5501.8 | 1676.1 | 5012.4 |
| 1984 | 483.0 | 1293.8 | 452.7 | 1212.6 |
| 1985 | 1980.9 | 8498.9 | 1890.7 | 8111.6 |
| 1986 | 357.4 | 924.1 | 295.1 | 763.0 |
| 1987 | 503.2 | 960.7 | 461.5 | 881.1 |
| 1988 | 1362.2 | 3993.1 | 1132.0 | 3318.1 |
| 1989 | 560.1 | 1865.5 | 393.0 | 1309.1 |
| 1990 | 583.7 | 1438.0 | 455.2 | 1121.6 |
| 1991 | 465.9 | 1838.9 | 373.1 | 1472.6 |
| 1992 | 289.8 | 639.1 | 204.2 | 450.4 |
| 1993 | 1176.3 | 2886.0 | 761.9 | 1869.4 |
| 1994 | 603.2 | 1879.5 | 288.9 | 900.2 |
| 1995 | 798.7 | 2033.4 | 510.7 | 1300.3 |
| 1996 | 247.6 | 802.5 | 149.7 | 485.1 |
| 1997 | 543.8 | 1378.9 | 328.2 | 832.0 |
| 1998 | 581.6 | 1633.1 | 271.2 | 761.5 |
| 1999 | 233.4 | 793.4 | 126.2 | 429.2 |
| 2000 | 581.0 | 1409.3 | 288.3 | 699.2 |
| 2001 | 168.6 | 376.5 | 99.3 | 221.7 |
| 2002 | 146.5 | 442.4 | 93.1 | 281.1 |
| 2003 | 162.4 | 711.6 | 94.2 | 412.9 |
| 2004 | 245.2 | 470.2 | 130.1 | 249.5 |
| 2005 | 511.2 | 1237.5 | 141.8 | 343.3 |
| 2006 | 79.4 | 316.9 | 39.6 | 158.2 |
| 2007 | 24.8 | 83.1 | 3.9 | 13.0 |

* Weight as estimated by MRFSS, re-estimated in assessment

Table A4. USA sampling of commercial Atlantic cod landings, by market category, for the Georges Bank and South stock (NAFO Division 5Z and Subarea 6), 1978- 2007.

| Year | Number of Samples, by Market Category & Quarter | | | | | | | | | | | | Annual Sampling Intensity | | | | | | |
|------|---|----|----|----|----------|--------|----|----|----|----------|-------|----|---------------------------|----|----------------------------|------|-----|------|----------|
| | Scrod | | | | | Market | | | | | Large | | | | No. of Tons Landed/Sampled | | | | |
| | Q1 | Q2 | Q3 | Q4 | Σ | Q1 | Q2 | Q3 | Q4 | Σ | Q1 | Q2 | Q3 | Q4 | Σ | Scrd | Mkt | Lge | Σ |
| 1978 | 17 | 15 | 6 | 3 | 41 | 9 | 12 | 13 | 9 | 43 | 1 | 0 | 1 | 2 | 4 | 69 | 374 | 1922 | 302 |
| 1979 | 2 | 5 | 14 | 8 | 29 | 6 | 19 | 11 | 8 | 44 | 2 | 0 | 4 | 1 | 7 | 88 | 407 | 1742 | 408 |
| 1980 | 7 | 10 | 13 | 4 | 34 | 12 | 14 | 5 | 1 | 32 | 3 | 0 | 0 | 0 | 3 | 136 | 588 | 5546 | 580 |
| 1981 | 4 | 10 | 11 | 3 | 28 | 6 | 9 | 10 | 2 | 27 | 2 | 0 | 0 | 0 | 2 | 149 | 634 | 6283 | 594 |
| 1982 | 5 | 9 | 32 | 9 | 55 | 6 | 20 | 27 | 13 | 66 | 8 | 8 | 9 | 5 | 30 | 156 | 279 | 410 | 260 |
| 1983 | 4 | 12 | 17 | 10 | 43 | 12 | 19 | 22 | 14 | 67 | 2 | 15 | 16 | 3 | 36 | 185 | 291 | 259 | 252 |
| 1984 | 6 | 8 | 8 | 7 | 29 | 8 | 15 | 8 | 11 | 42 | 18 | 5 | 3 | 3 | 29 | 138 | 441 | 358 | 329 |
| 1985 | 6 | 7 | 16 | 5 | 34 | 11 | 11 | 12 | 8 | 42 | 4 | 8 | 7 | 5 | 24 | 201 | 299 | 310 | 268 |
| 1986 | 6 | 7 | 7 | 6 | 26 | 8 | 10 | 10 | 11 | 39 | 6 | 5 | 10 | 8 | 29 | 142 | 215 | 186 | 186 |
| 1987 | 7 | 8 | 6 | 8 | 29 | 6 | 8 | 9 | 10 | 33 | 6 | 6 | 4 | 2 | 18 | 240 | 220 | 267 | 238 |
| 1988 | 8 | 6 | 7 | 5 | 26 | 13 | 7 | 9 | 9 | 38 | 4 | 4 | 3 | 1 | 12 | 283 | 331 | 532 | 346 |
| 1989 | 2 | 7 | 9 | 9 | 27 | 7 | 8 | 8 | 7 | 30 | 3 | 4 | 1 | 1 | 9 | 210 | 450 | 660 | 380 |
| 1990 | 8 | 9 | 10 | 4 | 31 | 10 | 13 | 9 | 8 | 40 | 4 | 4 | 4 | 0 | 12 | 295 | 315 | 538 | 340 |
| 1991 | 6 | 11 | 7 | 5 | 29 | 12 | 13 | 8 | 8 | 41 | 4 | 6 | 3 | 5 | 18 | 158 | 293 | 423 | 275 |
| 1992 | 6 | 7 | 7 | 10 | 30 | 8 | 10 | 6 | 9 | 33 | 5 | 5 | 3 | 1 | 14 | 149 | 215 | 377 | 219 |
| 1993 | 5 | 16 | 7 | 6 | 34 | 10 | 10 | 7 | 9 | 36 | 6 | 1 | 3 | 2 | 12 | 126 | 173 | 339 | 178 |
| 1994 | 3 | 9 | 8 | 2 | 22 | 5 | 11 | 7 | 4 | 27 | 1 | 4 | 3 | 1 | 9 | 92 | 187 | 290 | 167 |
| 1995 | 2 | 3 | 13 | 2 | 20 | 2 | 4 | 10 | 2 | 18 | 0 | 1 | 0 | 1 | 2 | 83 | 181 | 880 | 167 |
| 1996 | 6 | 2 | 12 | 3 | 23 | 5 | 6 | 11 | 6 | 28 | 0 | 2 | 1 | 1 | 4 | 59 | 143 | 400 | 127 |
| 1997 | 3 | 11 | 3 | 10 | 27 | 5 | 16 | 9 | 9 | 39 | 3 | 6 | 0 | 5 | 14 | 50 | 105 | 148 | 93 |
| 1998 | 3 | 7 | 23 | 5 | 38 | 10 | 10 | 15 | 3 | 38 | 1 | 2 | 1 | 0 | 3 | 44 | 92 | 573 | 87 |
| 1999 | 5 | 3 | 10 | 3 | 21 | 7 | 14 | 10 | 7 | 38 | 2 | 5 | 2 | 0 | 9 | 80 | 118 | 205 | 120 |
| 2000 | 21 | 19 | 16 | 27 | 83 | 20 | 14 | 13 | 16 | 63 | 2 | 2 | 2 | 2 | 8 | 18 | 72 | 192 | 49 |
| 2001 | 11 | 9 | 13 | 3 | 36 | 9 | 10 | 8 | 10 | 37 | 6 | 12 | 6 | 10 | 34 | 72 | 163 | 55 | 98 |
| 2002 | 5 | 7 | 7 | 1 | 20 | 8 | 10 | 11 | 6 | 35 | 14 | 8 | 6 | 3 | 31 | 80 | 153 | 63 | 107 |
| 2003 | 4 | 8 | 6 | 10 | 28 | 7 | 16 | 10 | 6 | 39 | 5 | 11 | 10 | 4 | 30 | 21 | 113 | 52 | 69 |
| 2004 | 8 | 11 | 4 | 10 | 33 | 14 | 6 | 8 | 13 | 41 | 25 | 13 | 2 | 11 | 51 | 8 | 53 | 20 | 28 |
| 2005 | 6 | 13 | 4 | 5 | 28 | 5 | 11 | 12 | 8 | 36 | 7 | 11 | 7 | 7 | 32 | 7 | 51 | 22 | 28 |
| 2006 | 11 | 16 | 8 | 14 | 49 | 13 | 15 | 10 | 13 | 51 | 25 | 28 | 7 | 18 | 78 | 6 | 37 | 6 | 15 |
| 2007 | 8 | 4 | 5 | 4 | 21 | 10 | 8 | 6 | 4 | 28 | 9 | 10 | 6 | 7 | 32 | 22 | 98 | 14 | 45 |

Table A5. USA and Canadian sampling of commercial Atlantic cod landings from the Georges Bank and South stock (NAFO Division 5Z and Subarea 6), 1978 - 2007.

| Year | USA | | | | Canada | | | |
|------|----------------|--------------------|-------------|----------------|----------------|--------------------|-------------|----------------|
| | Length Samples | | Age Samples | | Length Samples | | Age Samples | |
| | No. | # Fish Measured | No. | # Fish Aged | No. | # Fish Measured | No. | # Fish Aged |
| 1978 | 88 | 6841 | 76 | 1463 | 29 | 7684 | 29 | 1308 |
| 1979 | 80 | 6973 | 79 | 1647 | 13 | 3991 | 12 | 656 |
| 1980 | 69 | 4990 | 67 | 1119 | 10 | 2784 | 10 | 536 |
| 1981 | 57 | 4304 | 57 | 1231 | 17 | 4147 | 16 | 842 |
| 1982 | 151 | 11970 | 147 | 2579 | 17 | 4756 | 8 | 858 |
| 1983 | 146 | 12544 | 138 | 2945 | 15 | 3822 | 14 | 604 |
| 1984 | 100 | 8721 | 100 | 2431 | 7 | 1889 | 7 | 385 |
| 1985 | 100 | 8366 | 100 | 2321 | 29 | 7644 | 20 | 1062 |
| 1986 | 94 | 7515 | 94 | 2222 | 19 | 5745 | 19 | 888 |
| 1987 | 80 | 6395 | 79 | 1704 | 33 | 9477 | 33 | 1288 |
| 1988 | 76 | 6483 | 76 | 1576 | 40 | 11709 | 40 | 1984 |
| 1989 | 66 | 5547 | 66 | 1350 | 32 | 8716 | 32 | 1561 |
| 1990 | 83 | 7158 | 83 | 1700 | 40 | 9901 | 40 | 2012 |
| 1991 | 88 | 7708 | 88 | 1865 | 45 | 10873 | 45 | 1782 |
| 1992 | 77 | 6549 | 77 | 1631 | 48 | 10878 | 48 | 1906 |
| 1993 | 82 | 6636 | 82 | 1598 | 51 | 12158 | 51 | 2146 |
| 1994 | 58 | 4688 | 54 | 1064 | 104 | 25845 | 101 | 1268 |
| 1995 | 40 | 2879 | 40 | 778 | 36 | 11598 | 36 | 548 |
| 1996 | 55 | 4600 | 54 | 1080 | 129 | 26663 | 129 | 879 |
| 1997 | 80 | 6638 | 80 | 1581 | 118 | 31882 | 38 | 1244 |
| 1998 | 80 | 7076 | 81 | 1545 | 139 | 26549 | 139 | 1720 |
| 1999 | 68 | 5987 | 67 | 1503 | 84 | 24954 | 84 | 918 |
| 2000 | 154 | 12421 | 154 | 3043 | 107 | 20782 | 107 | 1436 |
| 2001 | 108 | 8389 | 108 | 2421 | 108 | 18190 | 108 | 1509 |
| 2002 | 86 | 6400 | 86 | 2179 | 91 | 18974 | 91 | 1264 |
| 2003 | 92 | 6116 | 90 | 2135 | 94 | 20199 | 94 | 1070 |
| 2004 | 125 | 8749 | 107 | 2755 | 127 | 17859 | 127 | 1370 |
| 2005 | 98 | 4705 | 86 | 1681 | 136 | 21942 | 136 | 1483 |
| 2006 | 178 | 9431 | 2798 | 163 | 258 | 43259 | 258 | 1455 |
| 2007 | 81 | 8291 | 76 | 2432 | 494 | 139816 | 494 | 1672 |

Table A6. Commercial landings at age (thousands of fish; metric tons) and mean weight (kg) and mean length (cm) at age of USA commercial landings of Atlantic cod from the Georges Bank and South stock (NAFO Division 5Z and Subarea 6), 1978-2007.

| Year | Age | | | | | | | | | | | Total |
|--|-----|------|------|------|------|-----|-----|-----|-----|-----|-------|-------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10+ | | |
| <u>USA Commercial Landings in Numbers (000's) at Age</u> | | | | | | | | | | | | |
| 1978 | 0 | 291 | 6012 | 1767 | 687 | 102 | 185 | 11 | 30 | 4 | 9088 | |
| 1979 | 48 | 1542 | 611 | 3809 | 903 | 395 | 142 | 295 | 9 | 32 | 7785 | |
| 1980 | 102 | 3092 | 4761 | 328 | 2045 | 858 | 386 | 59 | 125 | 4 | 11760 | |
| 1981 | 39 | 2853 | 3725 | 2016 | 171 | 902 | 295 | 90 | 135 | 43 | 10269 | |
| 1982 | 428 | 7565 | 2817 | 1750 | 1228 | 130 | 447 | 95 | 50 | 59 | 14568 | |
| 1983 | 88 | 3461 | 5638 | 1374 | 881 | 658 | 85 | 155 | 56 | 82 | 12477 | |
| 1984 | 70 | 1342 | 3275 | 2864 | 571 | 422 | 374 | 39 | 145 | 84 | 9186 | |
| 1985 | 126 | 4159 | 1636 | 1032 | 1343 | 314 | 191 | 154 | 16 | 75 | 9045 | |
| 1986 | 134 | 1142 | 3194 | 467 | 375 | 390 | 56 | 50 | 44 | 24 | 5877 | |
| 1987 | 19 | 4873 | 814 | 1380 | 204 | 163 | 154 | 34 | 21 | 18 | 7679 | |
| 1988 | 0 | 1679 | 5492 | 695 | 1059 | 149 | 88 | 90 | 17 | 24 | 9293 | |
| 1989 | 0 | 1649 | 2633 | 3291 | 254 | 352 | 49 | 28 | 23 | 3 | 8283 | |
| 1990 | 0 | 4647 | 3313 | 1279 | 1401 | 126 | 122 | 16 | 9 | 8 | 10920 | |
| 1991 | 43 | 1164 | 2842 | 1841 | 830 | 562 | 65 | 42 | 12 | 6 | 7406 | |
| 1992 | 1 | 2307 | 1333 | 761 | 939 | 256 | 177 | 19 | 15 | 3 | 5811 | |
| 1993 | 0 | 769 | 3118 | 608 | 288 | 283 | 83 | 71 | 16 | 3 | 5238 | |
| 1994 | 0.0 | 226 | 1108 | 1345 | 201 | 59 | 96 | 29 | 14 | 4 | 3081 | |
| 1995 | 0.0 | 341 | 1007 | 570 | 310 | 28 | 19 | 19 | 5 | 1 | 2300 | |
| 1996 | 0.0 | 211 | 753 | 947 | 191 | 137 | 8 | 9 | 10 | 0 | 2266 | |
| 1997 | 0.0 | 399 | 539 | 674 | 566 | 75 | 60 | 11 | 6 | 3 | 2331 | |
| 1998 | 8.2 | 693 | 979 | 349 | 259 | 190 | 24 | 8 | 2 | 0 | 2511 | |
| 1999 | 0.0 | 256 | 1664 | 607 | 211 | 86 | 113 | 15 | 2.0 | 0.2 | 2953 | |
| 2000 | 9 | 722 | 628 | 866 | 206 | 58 | 30 | 29 | 2 | 0 | 2550 | |
| 2001 | 1 | 508 | 2301 | 616 | 457 | 111 | 34 | 15 | 11 | 1 | 4054 | |
| 2002 | 0 | 32 | 1001 | 1293 | 310 | 285 | 68 | 13 | 8 | 5 | 3015 | |
| 2003 | 0 | 74 | 279 | 650 | 707 | 117 | 95 | 17 | 4 | 2 | 1946 | |
| 2004 | 0 | 30 | 272 | 153 | 228 | 158 | 34 | 26 | 6 | 3 | 911 | |
| 2005 | 0 | 22 | 96 | 358 | 100 | 77 | 55 | 8 | 4 | 2 | 721 | |
| 2006 | 0 | 12 | 440 | 129 | 185 | 29 | 14 | 13 | 2 | 2 | 825 | |
| 2007 | | 129 | 168 | 771 | 44 | 62 | 5 | 4 | 2 | 1 | 1186 | |

Table A6 - continued. Commercial landings at age (thousands of fish; metric tons) and mean weight (kg) and mean length (cm) at age of USA commercial landings of Atlantic cod from the Georges Bank and South stock (NAFO Division 5Z and Subarea 6), 1978-2007.

| Year | Age | | | | | | | | | | | Total |
|--|------|-------|-------|-------|-------|------|------|------|------|-------|-------|-------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10+ | | |
| <u>USA Commercial Landings in Weight (Tons) at Age</u> | | | | | | | | | | | | |
| 1978 | 0 | 377 | 14847 | 6355 | 2804 | 546 | 1229 | 76 | 304 | 41 | 26579 | |
| 1979 | 42 | 2202 | 1262 | 16766 | 4550 | 2886 | 1373 | 3042 | 89 | 435 | 32645 | |
| 1980 | 84 | 4610 | 11660 | 1236 | 11661 | 5825 | 3244 | 566 | 1112 | 54 | 40053 | |
| 1981 | 41 | 4285 | 8895 | 7035 | 847 | 6534 | 2558 | 893 | 1960 | 801 | 33849 | |
| 1982 | 283 | 10616 | 7596 | 6543 | 6604 | 864 | 4299 | 959 | 667 | 902 | 39333 | |
| 1983 | 94 | 5119 | 13773 | 4792 | 4312 | 4282 | 722 | 1668 | 645 | 1,350 | 36756 | |
| 1984 | 72 | 2151 | 8080 | 10435 | 2887 | 2823 | 3279 | 396 | 1614 | 1178 | 32915 | |
| 1985 | 118 | 5857 | 3475 | 4051 | 6910 | 2009 | 1563 | 1603 | 194 | 1048 | 26828 | |
| 1986 | 126 | 1638 | 7325 | 1606 | 2036 | 2796 | 508 | 510 | 594 | 351 | 17490 | |
| 1987 | 16 | 6849 | 2014 | 5556 | 1147 | 1290 | 1309 | 338 | 240 | 275 | 19035 | |
| 1988 | 2533 | 12755 | 2313 | 5556 | 1021 | 733 | 851 | 201 | 347 | 26310 | | |
| 1989 | 2750 | 5861 | 11937 | 1288 | 2274 | 406 | 262 | 241 | 37 | 25056 | | |
| 1990 | 7087 | 7638 | 4488 | 6723 | 782 | 1013 | 175 | 101 | 102 | 28110 | | |
| 1991 | 50 | 1799 | 6990 | 6616 | 4246 | 3412 | 498 | 383 | 137 | 88 | 24219 | |
| 1992 | 1 | 3423 | 3094 | 2961 | 4202 | 1571 | 1251 | 174 | 165 | 59 | 16899 | |
| 1993 | 0 | 1171 | 6787 | 2020 | 1526 | 1625 | 638 | 629 | 150 | 43 | 14590 | |
| 1994 | 306 | 2306 | 4594 | 965 | 427 | 670 | 261 | 140 | 67 | 9737 | | |
| 1995 | 511 | 2006 | 2152 | 1627 | 231 | 175 | 234 | 66 | 27 | 7028 | | |
| 1996 | 0 | 320 | 1820 | 3021 | 910 | 900 | 79 | 94 | 113 | 2 | 7259 | |
| 1997 | 628 | 1260 | 2377 | 2219 | 429 | 447 | 83 | 68 | 34 | 7545 | | |
| 1998 | 4.4 | 1020 | 2204 | 1241 | 1241 | 1059 | 192 | 57 | 23 | 2 | 7044 | |
| 1999 | 394 | 3528 | 1997 | 988 | 504 | 759 | 127 | 22 | 2 | 8319 | | |
| 2000 | 10 | 1227 | 1536 | 3034 | 978 | 341 | 225 | 242 | 18 | 0.2 | 7612 | |
| 2001 | 0 | 781 | 5197 | 1809 | 1908 | 599 | 220 | 117 | 101 | 13 | 10746 | |
| 2002 | 60 | 2166 | 3846 | 1225 | 1485 | 439 | 105 | 80 | 63 | 9470 | | |
| 2003 | 152 | 663 | 1945 | 2785 | 570 | 560 | 123 | 37 | 22 | 6856 | | |
| 2004 | 61 | 744 | 507 | 921 | 791 | 195 | 197 | 56 | 34 | 3507 | | |
| 2005 | 41 | 246 | 1226 | 410 | 386 | 313 | 65 | 40 | 29 | 2754 | | |
| 2006 | 24 | 1,110 | 464 | 748 | 138 | 89 | 89 | 14 | 18 | 2694 | | |
| 2007 | 263 | 423 | 2,469 | 175 | 269 | 30 | 27 | 17 | 6 | 3678 | | |

Table A6 - continued. Commercial landings at age (thousands of fish; metric tons) and mean weight (kg) and mean length (cm) at age of USA commercial landings of Atlantic cod from the Georges Bank and South stock (NAFO Division 5Z and Subarea 6), 1978-2007.

| Year | Age | | | | | | | | | | |
|--|-------|-------|-------|-------|-------|-------|--------|--------|--------|--------|-------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10+ | Mean |
| <u>USA Commercial Landings Mean Weight (kg) at Age</u> | | | | | | | | | | | |
| 1978 | 0.582 | 1.297 | 2.470 | 3.597 | 4.078 | 5.331 | 6.651 | 7.086 | 10.139 | 11.288 | 2.925 |
| 1979 | 0.868 | 1.428 | 2.065 | 4.402 | 5.041 | 7.309 | 9.702 | 10.310 | 9.874 | 13.568 | 4.194 |
| 1980 | 0.824 | 1.491 | 2.450 | 3.766 | 5.703 | 6.789 | 8.403 | 9.517 | 8.918 | 12.946 | 3.406 |
| 1981 | 1.071 | 1.502 | 2.388 | 3.489 | 4.958 | 7.247 | 8.662 | 9.881 | 14.572 | 18.590 | 3.296 |
| 1982 | 0.661 | 1.403 | 2.697 | 3.738 | 5.378 | 6.624 | 9.625 | 10.108 | 13.254 | 15.415 | 2.700 |
| 1983 | 1.066 | 1.479 | 2.442 | 3.487 | 4.895 | 6.506 | 8.544 | 10.774 | 11.586 | 16.505 | 2.945 |
| 1984 | 1.026 | 1.603 | 2.468 | 3.643 | 5.056 | 6.689 | 8.759 | 10.099 | 11.168 | 14.101 | 3.583 |
| 1985 | 0.935 | 1.408 | 2.124 | 3.926 | 5.147 | 6.406 | 8.190 | 10.423 | 12.459 | 14.012 | 2.966 |
| 1986 | 0.945 | 1.434 | 2.293 | 3.440 | 5.434 | 7.160 | 9.020 | 10.099 | 13.347 | 14.863 | 2.976 |
| 1987 | 0.857 | 1.406 | 2.474 | 4.027 | 5.634 | 7.910 | 8.507 | 9.888 | 11.670 | 14.828 | 2.479 |
| 1988 | 0.000 | 1.508 | 2.322 | 3.329 | 5.245 | 6.853 | 8.350 | 9.452 | 11.541 | 14.755 | 2.831 |
| 1989 | 0.000 | 1.668 | 2.226 | 3.627 | 5.066 | 6.454 | 8.260 | 9.348 | 10.640 | 10.811 | 3.025 |
| 1990 | 0.000 | 1.525 | 2.305 | 3.509 | 4.799 | 6.200 | 8.317 | 11.255 | 11.547 | 12.581 | 2.574 |
| 1991 | 1.174 | 1.546 | 2.460 | 3.594 | 5.116 | 6.073 | 7.667 | 9.080 | 11.005 | 14.979 | 3.270 |
| 1992 | 1.016 | 1.484 | 2.321 | 3.893 | 4.477 | 6.127 | 7.070 | 9.323 | 10.818 | 17.028 | 2.908 |
| 1993 | 0.866 | 1.523 | 2.177 | 3.323 | 5.303 | 5.741 | 7.671 | 8.813 | 9.617 | 15.320 | 2.785 |
| 1994 | 0.000 | 1.354 | 2.081 | 3.415 | 4.809 | 7.280 | 6.983 | 9.174 | 9.972 | 18.039 | 3.160 |
| 1995 | 0.000 | 1.499 | 1.992 | 3.773 | 5.253 | 8.397 | 9.268 | 12.303 | 12.152 | 19.118 | 3.056 |
| 1996 | 0.000 | 1.517 | 2.418 | 3.192 | 4.755 | 6.555 | 10.069 | 10.166 | 11.114 | 9.283 | 3.203 |
| 1997 | 0.000 | 1.577 | 2.337 | 3.529 | 3.919 | 5.727 | 7.473 | 7.856 | 11.241 | 12.006 | 3.236 |
| 1998 | 0.536 | 1.473 | 2.250 | 3.558 | 4.799 | 5.581 | 7.884 | 7.587 | 12.382 | 10.299 | 2.804 |
| 1999 | 0.000 | 1.542 | 2.119 | 3.291 | 4.686 | 5.851 | 6.739 | 8.700 | 10.792 | 10.671 | 2.817 |
| 2000 | 1.177 | 1.699 | 2.447 | 3.504 | 4.755 | 5.853 | 7.488 | 8.271 | 7.890 | 10.789 | 2.985 |
| 2001 | 0.727 | 1.539 | 2.258 | 2.938 | 4.174 | 5.407 | 6.479 | 7.785 | 9.334 | 10.907 | 2.650 |
| 2002 | 0.000 | 1.834 | 2.165 | 2.974 | 3.948 | 5.221 | 6.510 | 8.076 | 9.425 | 12.166 | 3.141 |
| 2003 | 0.000 | 2.048 | 2.378 | 2.992 | 3.937 | 4.879 | 5.927 | 7.079 | 8.708 | 10.994 | 3.524 |
| 2004 | 0.000 | 2.020 | 2.735 | 3.306 | 4.037 | 4.998 | 5.673 | 7.655 | 8.668 | 11.827 | 3.847 |
| 2005 | 0.000 | 1.811 | 2.569 | 3.426 | 4.118 | 5.033 | 5.737 | 8.174 | 9.189 | 12.260 | 3.821 |
| 2006 | 0.000 | 2.080 | 2.524 | 3.594 | 4.048 | 4.706 | 6.129 | 7.039 | 8.013 | 10.197 | 3.264 |
| 2007 | 0.000 | 2.080 | 2.524 | 3.594 | 4.048 | 4.706 | 6.129 | 7.039 | 8.013 | 8.441 | 3.387 |

Table A6 - continued. Commercial landings at age (thousands of fish; metric tons) and mean weight (kg) and mean length (cm) at age of USA commercial landings of Atlantic cod from the Georges Bank and South stock (NAFO Division 5Z and Subarea 6), 1978-2007.

| Year | Age | | | | | | | | | | |
|--|------|------|------|------|------|------|------|-------|-------|-------|------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10+ | Mean |
| <u>USA Commercial Landings Mean Length (cm) at Age</u> | | | | | | | | | | | |
| 1978 | 39.0 | 50.2 | 61.5 | 69.2 | 71.6 | 78.8 | 85.3 | 87.7 | 97.7 | 100.7 | 64.2 |
| 1979 | 44.3 | 51.9 | 57.7 | 74.2 | 77.9 | 88.2 | 97.8 | 99.6 | 98.5 | 108.8 | 71.0 |
| 1980 | 43.3 | 52.5 | 61.3 | 70.9 | 81.4 | 86.6 | 92.5 | 95.1 | 94.5 | 107.7 | 66.0 |
| 1981 | 47.4 | 52.4 | 60.9 | 69.0 | 77.7 | 88.3 | 94.0 | 97.9 | 111.7 | 120.7 | 64.9 |
| 1982 | 39.7 | 51.6 | 63.2 | 70.1 | 79.6 | 85.3 | 97.1 | 98.5 | 107.9 | 113.1 | 60.5 |
| 1983 | 47.5 | 52.5 | 61.4 | 68.6 | 77.1 | 84.9 | 93.1 | 100.6 | 103.0 | 116.0 | 63.2 |
| 1984 | 46.9 | 53.7 | 61.7 | 70.1 | 78.0 | 86.0 | 94.0 | 98.6 | 102.0 | 109.5 | 67.7 |
| 1985 | 45.4 | 51.6 | 58.5 | 72.0 | 78.7 | 84.7 | 91.8 | 99.7 | 105.5 | 109.7 | 62.5 |
| 1986 | 45.6 | 51.7 | 60.2 | 68.1 | 79.6 | 88.0 | 95.0 | 98.6 | 108.1 | 111.8 | 63.2 |
| 1987 | 44.2 | 51.6 | 61.6 | 72.5 | 81.3 | 91.3 | 93.1 | 97.9 | 103.4 | 111.7 | 59.4 |
| 1988 | | 53.0 | 60.6 | 67.4 | 78.9 | 86.5 | 92.4 | 96.4 | 102.8 | 111.3 | 63.1 |
| 1989 | | 54.7 | 59.8 | 69.9 | 77.9 | 84.2 | 91.3 | 96.6 | 100.6 | 101.3 | 64.8 |
| 1990 | | 53.2 | 60.2 | 68.9 | 76.4 | 83.1 | 91.8 | 102.2 | 103.3 | 106.4 | 61.1 |
| 1991 | 49.0 | 53.3 | 61.7 | 69.3 | 78.1 | 82.5 | 89.5 | 93.3 | 100.8 | 111.3 | 66.1 |
| 1992 | 46.8 | 52.7 | 60.9 | 72.1 | 75.5 | 83.5 | 88.7 | 96.3 | 102.8 | 119.1 | 63.6 |
| 1993 | 45.0 | 53.0 | 59.7 | 68.5 | 79.9 | 82.1 | 91.7 | 95.7 | 98.5 | 112.2 | 63.2 |
| 1994 | | 51.3 | 58.6 | 69.0 | 77.7 | 89.2 | 89.0 | 97.6 | 100.0 | 121.4 | 66.0 |
| 1995 | | 52.7 | 57.9 | 71.0 | 80.8 | 93.3 | 97.6 | 106.5 | 106.8 | 121.9 | 64.8 |
| 1996 | | 53.1 | 61.5 | 67.5 | 76.9 | 87.2 | 96.9 | 100.9 | 103.0 | 99.0 | 66.5 |
| 1997 | | 53.6 | 60.9 | 69.6 | 72.2 | 83.3 | 91.2 | 92.5 | 104.6 | 107.2 | 66.7 |
| 1998 | 38.1 | 52.4 | 60.3 | 70.8 | 78.5 | 82.9 | 93.1 | 92.0 | 107.8 | 102.3 | 63.5 |
| 1999 | | 53.4 | 59.3 | 69.0 | 77.9 | 83.8 | 88.3 | 95.7 | 102.5 | 103.6 | 64.2 |
| 2000 | 48.9 | 54.8 | 62.1 | 70.1 | 77.6 | 83.6 | 90.8 | 94.6 | 93.7 | | 65.2 |
| 2001 | 42.0 | 53.1 | 60.3 | 65.8 | 74.0 | 81.2 | 86.4 | 91.9 | 98.4 | 103.3 | 62.8 |
| 2002 | | 56.4 | 59.4 | 66.4 | 72.8 | 80.0 | 86.3 | 92.6 | 97.6 | 107.2 | 66.6 |
| 2003 | | 58.3 | 61.4 | 66.5 | 73.1 | 78.3 | 84.0 | 89.1 | 94.9 | 103.2 | 69.7 |
| 2004 | | 58.2 | 64.0 | 68.9 | 73.9 | 79.5 | 82.9 | 92.0 | 95.5 | 106.2 | 71.6 |
| 2005 | | 56.1 | 63.0 | 69.6 | 74.7 | 79.7 | 83.1 | 93.9 | 96.9 | 106.7 | 71.6 |
| 2006 | | 58.7 | 62.3 | 70.6 | 73.8 | 77.4 | 85.0 | 89.0 | 90.8 | 100.4 | 67.6 |
| 2007 | 0.0 | 58.7 | 62.3 | 70.6 | 73.8 | 77.4 | 85.0 | 89.0 | 90.8 | 92.0 | 66.9 |

Table A7. Discards at age (thousands of fish; metric tons) and mean weight (kg) at age of USA commercial landings of Atlantic cod from the Georges Bank and South stock (NAFO Division 5Z and Subarea 6), 1978-2007.

| Year | Age | | | | | | | | | | Total |
|--|------|-----|-----|-----|----|---|---|---|-----|-----|-------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10+ | |
| <u>USA Commercial Discards in Numbers (000's) at Age</u> | | | | | | | | | | | |
| 1978 | 150 | 65 | 120 | 9 | 8 | 0 | 0 | 0 | 0 | 0 | 352 |
| 1979 | 231 | 330 | 15 | 13 | 2 | 0 | 0 | 0 | 0 | 0 | 591 |
| 1980 | 237 | 371 | 73 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 683 |
| 1981 | 578 | 529 | 62 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1169 |
| 1982 | 206 | 676 | 54 | 21 | 0 | 0 | 0 | 0 | 0 | 0 | 957 |
| 1983 | 171 | 378 | 103 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 655 |
| 1984 | 58 | 87 | 11 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 156 |
| 1985 | 12 | 289 | 14 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 315 |
| 1986 | 439 | 168 | 35 | 17 | 0 | 0 | 0 | 0 | 0 | 0 | 661 |
| 1987 | 16 | 190 | 54 | 5 | 1 | 0 | 0 | 0 | 0 | 0 | 266 |
| 1988 | 76 | 206 | 70 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 360 |
| 1989 | 715 | 521 | 89 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 1331 |
| 1990 | 43 | 444 | 119 | 12 | 4 | 0 | 0 | 0 | 0 | 0 | 623 |
| 1991 | 89 | 247 | 52 | 18 | 4 | 3 | 0 | 1 | 0 | 0 | 414 |
| 1992 | 91 | 607 | 23 | 8 | 7 | 2 | 2 | 0 | 0 | 0 | 740 |
| 1993 | 18 | 273 | 65 | 2 | 2 | 2 | 0 | 1 | 0 | 0 | 363 |
| 1994 | 46.6 | 135 | 30 | 6 | 1 | 0 | 0 | 0 | 0 | 0 | 219 |
| 1995 | 11.7 | 70 | 33 | 3 | 1 | 0 | 0 | 0 | 0 | 0 | 119 |
| 1996 | 34.7 | 29 | 19 | 10 | 2 | 1 | 0 | 0 | 0 | 0 | 96 |
| 1997 | 57.1 | 54 | 13 | 6 | 4 | 0 | 0 | 0 | 0 | 0 | 134 |
| 1998 | 15.9 | 25 | 16 | 6 | 3 | 1 | 0 | 0 | 0 | 0 | 69 |
| 1999 | 37.3 | 45 | 32 | 5 | 0 | 0 | 0 | 0 | 0.0 | 0.0 | 120 |
| 2000 | 13 | 67 | 22 | 17 | 3 | 1 | 0 | 0 | 0 | 0 | 123 |
| 2001 | 7 | 179 | 103 | 9 | 7 | 2 | 0 | 0 | 0 | 0 | 307 |
| 2002 | 25 | 66 | 116 | 25 | 5 | 0 | 0 | 0 | 0 | 0 | 237 |
| 2003 | 10 | 92 | 38 | 36 | 14 | 2 | 1 | 0 | 0 | 0 | 193 |
| 2004 | 20 | 30 | 70 | 4 | 4 | 2 | 0 | 0 | 0 | 0 | 129 |
| 2005 | 8 | 241 | 61 | 49 | 5 | 3 | 2 | 0 | 0 | 0 | 370 |
| 2006 | 19 | 36 | 195 | 10 | 12 | 1 | 0 | 0 | 0 | 0 | 273 |
| 2007 | 10 | 364 | 184 | 119 | 5 | 7 | 0 | 0 | 0 | 0 | 689 |

Table A7 - continued. Discards at age (thousands of fish; metric tons) and mean weight (kg) at age of USA commercial landings of Atlantic cod from the Georges Bank and South stock (NAFO Division 5Z and Subarea 6), 1978-2007.

| Year | Age | | | | | | | | | | Total |
|--|------|-----|-----|-----|----|----|----|---|---|-----|-------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10+ | |
| <u>USA Commercial Discards in Weight (Tons) at Age</u> | | | | | | | | | | | |
| 1978 | 86 | 60 | 129 | 12 | 9 | 0 | 0 | 0 | 0 | 0 | 298 |
| 1979 | 152 | 349 | 18 | 16 | 3 | 0 | 0 | 0 | 0 | 0 | 537 |
| 1980 | 135 | 337 | 93 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 569 |
| 1981 | 374 | 581 | 78 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1033 |
| 1982 | 139 | 757 | 64 | 26 | 0 | 0 | 0 | 0 | 0 | 0 | 985 |
| 1983 | 116 | 417 | 118 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 656 |
| 1984 | 27 | 61 | 9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 98 |
| 1985 | 6 | 324 | 20 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 349 |
| 1986 | 285 | 117 | 37 | 18 | 0 | 0 | 0 | 0 | 0 | 0 | 457 |
| 1987 | 10 | 186 | 63 | 6 | 2 | 0 | 0 | 0 | 0 | 0 | 266 |
| 1988 | 47 | 185 | 83 | 9 | 0 | 0 | 0 | 0 | 0 | 0 | 323 |
| 1989 | 292 | 456 | 99 | 15 | 1 | 2 | 0 | 0 | 0 | 0 | 865 |
| 1990 | 23 | 412 | 140 | 24 | 17 | 1 | 0 | 0 | 0 | 0 | 618 |
| 1991 | 60 | 251 | 69 | 43 | 24 | 18 | 1 | 9 | 0 | 0 | 476 |
| 1992 | 62 | 567 | 36 | 26 | 44 | 15 | 13 | 0 | 1 | 0 | 766 |
| 1993 | 7 | 251 | 74 | 8 | 12 | 14 | 4 | 5 | 1 | 0 | 376 |
| 1994 | 21 | 117 | 40 | 16 | 2 | 1 | 1 | 0 | 0 | 0 | 199 |
| 1995 | 5 | 61 | 36 | 12 | 2 | 0 | 0 | 0 | 0 | 0 | 116 |
| 1996 | 17 | 25 | 37 | 40 | 13 | 8 | . | 0 | 0 | 0 | 139 |
| 1997 | 31 | 50 | 23 | 14 | 9 | 0 | 0 | 0 | 0 | 0 | 127 |
| 1998 | 9.6 | 26 | 42 | 24 | 14 | 7 | 1 | 0 | 8 | 0 | 131 |
| 1999 | 19.1 | 36 | 58 | 17 | 2 | 0 | 0 | 0 | 0 | 0 | 132 |
| 2000 | 7 | 65 | 48 | 62 | 17 | 4 | 1 | 0 | 0 | 0 | 204 |
| 2001 | 6 | 152 | 129 | 28 | 43 | 12 | 3 | 2 | 1 | 0 | 374 |
| 2002 | 13 | 71 | 175 | 44 | 7 | 1 | 0 | 0 | 0 | 0 | 311 |
| 2003 | 6 | 103 | 66 | 87 | 53 | 9 | 7 | 2 | 0 | 0 | 335 |
| 2004 | 7 | 34 | 100 | 10 | 13 | 9 | 2 | 1 | 0 | 0 | 178 |
| 2005 | 4 | 245 | 106 | 138 | 18 | 16 | 11 | 3 | 1 | 0 | 541 |
| 2006 | 8 | 37 | 288 | 23 | 27 | 2 | 1 | 1 | 0 | 1 | 387 |
| 2007 | 4 | 453 | 267 | 278 | 14 | 20 | 2 | 1 | 1 | 0 | 1040 |

Table A7 - continued. Discards at age (thousands of fish; metric tons) and mean weight (kg) at age of USA commercial landings of Atlantic cod from the Georges Bank and South stock (NAFO Division 5Z and Subarea 6), 1978-2007.

| Year | Age | | | | | | | | | | |
|--|-------|-------|-------|-------|-------|-------|-------|--------|--------|--------|---------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10+ | Average |
| <u>USA Commercial Discards Mean Weight (kg) at Age</u> | | | | | | | | | | | |
| 1978 | 0.577 | 0.927 | 1.076 | 1.386 | 1.111 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.845 |
| 1979 | 0.658 | 1.059 | 1.185 | 1.209 | 1.242 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.909 |
| 1980 | 0.567 | 0.910 | 1.276 | 1.484 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.832 |
| 1981 | 0.648 | 1.097 | 1.257 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.883 |
| 1982 | 0.675 | 1.119 | 1.184 | 1.261 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1.030 |
| 1983 | 0.677 | 1.104 | 1.148 | 1.484 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1.001 |
| 1984 | 0.474 | 0.699 | 0.835 | 1.484 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.627 |
| 1985 | 0.474 | 1.119 | 1.400 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1.108 |
| 1986 | 0.648 | 0.694 | 1.049 | 1.059 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.692 |
| 1987 | 0.610 | 0.980 | 1.177 | 1.028 | 1.484 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 1.000 |
| 1988 | 0.615 | 0.900 | 1.178 | 1.093 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.898 |
| 1989 | 0.408 | 0.874 | 1.114 | 3.114 | 5.035 | 6.119 | 6.193 | 6.974 | 0.000 | 0.000 | 0.650 |
| 1990 | 0.524 | 0.929 | 1.181 | 1.964 | 3.875 | 4.159 | 4.536 | 6.273 | 0.000 | 0.000 | 0.993 |
| 1991 | 0.676 | 1.015 | 1.332 | 2.446 | 5.868 | 6.615 | 5.989 | 13.874 | 0.000 | 0.000 | 1.149 |
| 1992 | 0.685 | 0.934 | 1.579 | 3.263 | 5.997 | 7.374 | 8.146 | 8.107 | 9.389 | 0.000 | 1.035 |
| 1993 | 0.387 | 0.916 | 1.137 | 4.400 | 7.288 | 7.648 | 8.614 | 8.866 | 9.465 | 6.735 | 1.036 |
| 1994 | 0.441 | 0.867 | 1.355 | 2.656 | 4.480 | 6.420 | 6.356 | 6.974 | 0.000 | 0.000 | 0.909 |
| 1995 | 0.402 | 0.866 | 1.089 | 3.698 | 4.614 | 4.639 | 4.109 | 0.000 | 0.000 | 0.000 | 0.977 |
| 1996 | 0.499 | 0.874 | 1.886 | 3.856 | 5.526 | 6.628 | 0.000 | 0.000 | 5.213 | 0.000 | 1.440 |
| 1997 | 0.549 | 0.927 | 1.812 | 2.297 | 2.193 | 2.831 | 3.319 | 0.000 | 0.000 | 0.000 | 0.951 |
| 1998 | 0.603 | 1.011 | 2.590 | 3.910 | 4.583 | 5.176 | 6.309 | 7.987 | 16.634 | 0.000 | 1.916 |
| 1999 | 0.512 | 0.804 | 1.785 | 3.200 | 3.536 | 3.767 | 4.124 | 0.000 | 0.000 | 0.000 | 1.101 |
| 2000 | 0.542 | 0.964 | 2.231 | 3.555 | 4.882 | 5.383 | 6.052 | 5.608 | 0.000 | 0.000 | 1.654 |
| 2001 | 0.805 | 0.851 | 1.256 | 3.169 | 5.719 | 6.456 | 7.211 | 6.998 | 7.323 | 0.000 | 1.220 |
| 2002 | 0.522 | 1.083 | 1.502 | 1.735 | 1.622 | 4.044 | 4.215 | 3.780 | 5.213 | 0.000 | 1.313 |
| 2003 | 0.647 | 1.117 | 1.733 | 2.421 | 3.861 | 4.801 | 6.287 | 10.006 | 9.444 | 11.374 | 1.732 |
| 2004 | 0.359 | 1.154 | 1.439 | 2.777 | 3.796 | 4.865 | 5.792 | 8.059 | 7.990 | 10.056 | 1.383 |
| 2005 | 0.431 | 1.018 | 1.720 | 2.799 | 3.954 | 4.666 | 6.119 | 9.771 | 10.247 | 10.770 | 1.462 |
| 2006 | 0.431 | 1.010 | 1.480 | 2.276 | 2.199 | 3.125 | 5.130 | 7.728 | 3.713 | 16.153 | 1.418 |
| 2007 | 0.433 | 1.244 | 1.452 | 2.339 | 2.923 | 2.757 | 4.236 | 7.213 | 7.656 | 5.974 | 1.508 |

Table A8. Recreational landings at age (thousands of fish; metric tons) and mean weight (kg) at age of Atlantic cod from Georges Bank and South (NAFO Division 5Z and Subarea 6), 1981-2007.

| Year | Age | | | | | | | | | | Total |
|--|------|-----|------|-----|-----|-----|-----|-----|-----|-----|-------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10+ | |
| <u>USA Recreational Landings in Numbers (000's) at Age</u> | | | | | | | | | | | |
| 1978 | | | | | | | | | | | 0 |
| 1979 | | | | | | | | | | | 0 |
| 1980 | | | | | | | | | | | 0 |
| 1981 | 601 | 382 | 341 | 163 | 12 | 122 | 35 | 22 | 0 | 7 | 1684 |
| 1982 | 136 | 929 | 202 | 109 | 68 | 3 | 38 | 7 | 3 | 0 | 1495 |
| 1983 | 340 | 599 | 507 | 91 | 74 | 34 | 0 | 3 | 0 | 28 | 1676 |
| 1984 | 153 | 92 | 82 | 88 | 12 | 15 | 4 | 1 | 4 | 2 | 453 |
| 1985 | 34 | 849 | 388 | 275 | 258 | 44 | 31 | 5 | 3 | 4 | 1891 |
| 1986 | 176 | 46 | 49 | 7 | 6 | 7 | 0 | 1 | 3 | 1 | 295 |
| 1987 | 55 | 297 | 46 | 44 | 4 | 8 | 6 | 0 | 1 | 2 | 462 |
| 1988 | 239 | 238 | 476 | 51 | 100 | 7 | 3 | 18 | 0 | 0 | 1132 |
| 1989 | 176 | 124 | 29 | 51 | 6 | 5 | 1 | 0 | 0 | 0 | 393 |
| 1990 | 22 | 131 | 166 | 54 | 65 | 9 | 6 | 1 | 0 | 2 | 455 |
| 1991 | 135 | 59 | 86 | 60 | 23 | 8 | 2 | 0 | 0 | 0 | 373 |
| 1992 | 30 | 110 | 32 | 11 | 10 | 4 | 2 | 1 | 0 | 0 | 199 |
| 1993 | 277 | 241 | 177 | 21 | 15 | 7 | 3 | 0 | 10 | 3 | 755 |
| 1994 | 45.8 | 113 | 66 | 43 | 11 | 5 | 3 | 1 | 1 | 0 | 288 |
| 1995 | 20.6 | 203 | 226 | 32 | 18 | 4 | 1 | 0 | 0 | 0 | 503 |
| 1996 | 29.1 | 22 | 47 | 36 | 8 | 7 | 0 | 0 | 0 | 0 | 150 |
| 1997 | 66.5 | 123 | 42 | 48 | 37 | 4 | 5 | 0 | 0 | 0 | 326 |
| 1998 | 39.2 | 128 | 62 | 18 | 12 | 5 | 0 | 1 | 0 | 0 | 265 |
| 1999 | 9.0 | 17 | 34 | 36 | 16 | 5 | 5 | 0 | 1.9 | 0.0 | 124 |
| 2000 | 92 | 121 | 29 | 29 | 8 | 2 | 0 | 0 | 0 | 0 | 280 |
| 2001 | 4 | 23 | 55 | 6 | 9 | 1 | 0 | 0 | 0 | 0 | 98 |
| 2002 | 9 | 11 | 25 | 37 | 5 | 5 | 1 | 0 | 0 | 0 | 93 |
| 2003 | 7 | 29 | 16 | 19 | 16 | 2 | 2 | 0 | 0 | 0 | 92 |
| 2004 | 30 | 6 | 28 | 22 | 21 | 14 | 3 | 4 | 0 | 0 | 129 |
| 2005 | 3 | 76 | 16 | 32 | 7 | 3 | 3 | 0 | 0 | 0 | 141 |
| 2006 | 9.3 | 5.0 | 14.2 | 2.7 | 6.0 | 1.3 | 1.1 | 0.3 | 0.1 | 0.0 | 40 |
| 2007 | 0.5 | 1.1 | 0.3 | 1.4 | 0.2 | 0.4 | 0.1 | 0.0 | 0.0 | 0.0 | 4 |

Table A8 continued. Recreational landings at age (thousands of fish; metric tons) and mean weight (kg) at age of Atlantic cod from Georges Bank and South (NAFO Division 5Z and Subarea 6), 1981-2007.

| Year | Age | | | | | | | | | | | Total |
|--|------|------|------|-----|------|------|------|-----|-----|-----|------|-------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10+ | | |
| <u>USA Recreational Landings in Weight (Tons) at Age</u> | | | | | | | | | | | | |
| 1978 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1979 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1980 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1981 | 299 | 572 | 879 | 664 | 55 | 1096 | 302 | 206 | 0 | 90 | 4162 | |
| 1982 | 73 | 1335 | 437 | 320 | 311 | 16 | 366 | 63 | 35 | 0 | 2955 | |
| 1983 | 189 | 822 | 1509 | 333 | 340 | 195 | 0 | 24 | 0 | 454 | 3865 | |
| 1984 | 52 | 70 | 249 | 346 | 55 | 106 | 34 | 9 | 44 | 29 | 994 | |
| 1985 | 15 | 1116 | 834 | 848 | 1160 | 293 | 273 | 49 | 38 | 52 | 4678 | |
| 1986 | 93 | 34 | 104 | 23 | 39 | 53 | 1 | 10 | 42 | 25 | 425 | |
| 1987 | 25 | 463 | 120 | 188 | 22 | 58 | 48 | 0 | 5 | 40 | 970 | |
| 1988 | 105 | 230 | 1153 | 196 | 593 | 41 | 23 | 246 | 0 | 0 | 2587 | |
| 1989 | 96 | 130 | 62 | 157 | 24 | 23 | 9 | 2 | 6 | 0 | 507 | |
| 1990 | 10 | 165 | 437 | 216 | 358 | 61 | 40 | 10 | 4 | 38 | 1339 | |
| 1991 | 61 | 67 | 242 | 184 | 73 | 23 | 8 | 0 | 0 | 0 | 657 | |
| 1992 | 15 | 140 | 74 | 40 | 42 | 21 | 13 | 4 | 0 | 0 | 350 | |
| 1993 | 74 | 191 | 432 | 74 | 65 | 48 | 34 | 0 | 175 | 34 | 1127 | |
| 1994 | 23 | 109 | 159 | 164 | 46 | 19 | 7 | 8 | 8 | 0 | 544 | |
| 1995 | 8 | 250 | 375 | 88 | 90 | 12 | 4 | 0 | 0 | 0 | 826 | |
| 1996 | 13 | 31 | 113 | 112 | 46 | 50 | 1 | 2 | 0 | 0 | 367 | |
| 1997 | 34 | 159 | 112 | 175 | 170 | 19 | 45 | 1 | 0 | 0 | 715 | |
| 1998 | 25.2 | 164 | 130 | 51 | 41 | 20 | 0 | 3 | 0 | 0 | 434 | |
| 1999 | 5.2 | 21 | 79 | 145 | 72 | 27 | 21 | 1 | 16 | 0 | 387 | |
| 2000 | 27 | 105 | 53 | 88 | 31 | 5 | 1 | 0 | 0 | 0 | 309 | |
| 2001 | 1 | 34 | 115 | 21 | 29 | 4 | 1 | 0 | 0 | 0 | 205 | |
| 2002 | 3 | 13 | 59 | 113 | 19 | 25 | 4 | 0 | 0 | 0 | 237 | |
| 2003 | 4 | 31 | 34 | 56 | 59 | 6 | 13 | 1 | 0 | 0 | 203 | |
| 2004 | 10 | 7 | 55 | 73 | 79 | 65 | 24 | 25 | 3 | 4 | 345 | |
| 2005 | 2 | 70 | 29 | 82 | 33 | 12 | 14 | 2 | 0 | 0 | 243 | |
| 2006 | 3.7 | 3.8 | 24.7 | 6.6 | 18.8 | 4.5 | 14.6 | 1.6 | 0.3 | 0.0 | 79 | |
| 2007 | 0.1 | 0.8 | 0.4 | 3.0 | 0.9 | 1.9 | 0.3 | 0.1 | 0.0 | 0.0 | 8 | |

Table A8 continued. Recreational landings at age (thousands of fish; metric tons) and mean weight (kg) at age of Atlantic cod from Georges Bank and South (NAFO Division 5Z and Subarea 6), 1981-2007.

| Year | Age | | | | | | | | | | Average |
|--|-------|-------|-------|-------|-------|-------|--------|--------|--------|--------|---------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10+ | |
| <u>USA Recreational Landings Mean Weight (kg) at Age</u> | | | | | | | | | | | |
| 1978 | | | | | | | | | | | |
| 1979 | | | | | | | | | | | |
| 1980 | | | | | | | | | | | |
| 1981 | 0.497 | 1.497 | 2.580 | 4.070 | 4.608 | 8.963 | 8.720 | 9.583 | 0.000 | 12.351 | 2.471 |
| 1982 | 0.537 | 1.437 | 2.163 | 2.921 | 4.591 | 5.839 | 9.512 | 9.342 | 10.619 | 0.000 | 1.977 |
| 1983 | 0.557 | 1.372 | 2.973 | 3.671 | 4.623 | 5.701 | 0.000 | 7.181 | 0.000 | 16.211 | 2.306 |
| 1984 | 0.342 | 0.756 | 3.052 | 3.943 | 4.600 | 6.959 | 8.629 | 13.780 | 9.824 | 13.029 | 2.194 |
| 1985 | 0.453 | 1.315 | 2.152 | 3.078 | 4.497 | 6.675 | 8.684 | 10.084 | 11.956 | 13.353 | 2.474 |
| 1986 | 0.527 | 0.747 | 2.134 | 3.343 | 7.017 | 7.701 | 6.959 | 11.624 | 16.623 | 21.883 | 1.442 |
| 1987 | 0.457 | 1.558 | 2.614 | 4.283 | 5.587 | 7.414 | 7.516 | 0.000 | 9.095 | 26.331 | 2.100 |
| 1988 | 0.440 | 0.968 | 2.420 | 3.802 | 5.916 | 6.059 | 9.095 | 13.737 | 0.000 | 0.000 | 2.285 |
| 1989 | 0.543 | 1.042 | 2.119 | 3.093 | 4.052 | 5.052 | 7.178 | 8.255 | 11.590 | 0.000 | 1.291 |
| 1990 | 0.448 | 1.267 | 2.631 | 4.030 | 5.515 | 6.636 | 7.126 | 9.990 | 9.095 | 17.518 | 2.943 |
| 1991 | 0.451 | 1.137 | 2.818 | 3.063 | 3.138 | 3.021 | 3.780 | 0.000 | 0.000 | 0.000 | 1.762 |
| 1992 | 0.513 | 1.267 | 2.356 | 3.738 | 4.189 | 5.595 | 5.568 | 7.469 | 0.000 | 0.000 | 1.756 |
| 1993 | 0.268 | 0.794 | 2.437 | 3.493 | 4.289 | 7.261 | 9.990 | 0.000 | 17.072 | 9.990 | 1.492 |
| 1994 | 0.495 | 0.965 | 2.434 | 3.832 | 4.068 | 4.086 | 2.405 | 14.559 | 14.559 | 0.000 | 1.892 |
| 1995 | 0.393 | 1.234 | 1.659 | 2.715 | 5.051 | 3.274 | 6.051 | 0.000 | 0.000 | 0.000 | 1.642 |
| 1996 | 0.454 | 1.399 | 2.380 | 3.160 | 5.936 | 6.775 | 2.898 | 5.415 | 0.000 | 0.000 | 2.455 |
| 1997 | 0.509 | 1.287 | 2.693 | 3.630 | 4.608 | 4.952 | 8.582 | 4.281 | 0.000 | 0.000 | 2.195 |
| 1998 | 0.642 | 1.285 | 2.074 | 2.907 | 3.458 | 3.954 | 0.000 | 4.814 | 0.000 | 0.000 | 1.638 |
| 1999 | 0.584 | 1.203 | 2.303 | 4.016 | 4.568 | 5.376 | 4.686 | 3.780 | 8.529 | 0.000 | 3.121 |
| 2000 | 0.291 | 0.864 | 1.861 | 3.023 | 4.028 | 2.818 | 4.826 | 0.000 | 0.000 | 0.000 | 1.102 |
| 2001 | 0.255 | 1.500 | 2.090 | 3.265 | 3.392 | 4.348 | 5.621 | 0.000 | 0.000 | 0.000 | 2.099 |
| 2002 | 0.400 | 1.189 | 2.336 | 3.096 | 3.942 | 4.747 | 5.521 | 0.000 | 0.000 | 0.000 | 2.562 |
| 2003 | 0.557 | 1.059 | 2.173 | 2.876 | 3.667 | 2.766 | 5.486 | 5.415 | 0.000 | 0.000 | 2.207 |
| 2004 | 0.316 | 1.190 | 1.988 | 3.267 | 3.837 | 4.637 | 7.081 | 5.941 | 7.469 | 10.301 | 2.663 |
| 2005 | 0.507 | 0.918 | 1.777 | 2.549 | 4.452 | 4.137 | 4.124 | 6.735 | 0.000 | 0.000 | 1.714 |
| 2006 | 0.397 | 0.753 | 1.733 | 2.431 | 3.141 | 3.447 | 13.837 | 5.137 | 4.281 | 0.000 | 1.963 |
| 2007 | 0.289 | 0.794 | 1.400 | 2.132 | 4.657 | 5.329 | 4.652 | 6.051 | 0.000 | 0.000 | 1.943 |

Table A9. Landings at age (thousands of fish; metric tons) and mean weight (kg) at age of Canadian commercial landings of Atlantic cod from the Georges Bank and South stock (NAFO Division 5Z and Subarea 6), 1978-2007.

| Year | Age | | | | | | | | | | Total |
|---|-----|------|------|------|-----|-----|-----|-----|----|-----|-------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10+ | |
| <u>Canadian Commercial Landings in Numbers (000's) at Age</u> | | | | | | | | | | | |
| 1978 | 2 | 61 | 1977 | 654 | 201 | 76 | 56 | 12 | 12 | 7 | 3058 |
| 1979 | 0 | 371 | 328 | 763 | 302 | 55 | 18 | 9 | 4 | 3 | 1853 |
| 1980 | 1 | 776 | 1122 | 214 | 420 | 125 | 32 | 11 | 14 | 10 | 2725 |
| 1981 | 2 | 146 | 611 | 506 | 135 | 382 | 87 | 51 | 21 | 16 | 1957 |
| 1982 | 6 | 1287 | 1362 | 1108 | 744 | 164 | 222 | 97 | 21 | 26 | 5037 |
| 1983 | 27 | 744 | 2505 | 1212 | 201 | 54 | 10 | 17 | 12 | 3 | 4785 |
| 1984 | 0 | 26 | 118 | 376 | 341 | 123 | 72 | 19 | 18 | 39 | 1132 |
| 1985 | 4 | 2147 | 904 | 383 | 497 | 139 | 45 | 38 | 9 | 11 | 4177 |
| 1986 | 19 | 238 | 1298 | 369 | 145 | 218 | 29 | 19 | 9 | 3 | 2347 |
| 1987 | 14 | 2596 | 602 | 741 | 91 | 79 | 117 | 22 | 15 | 6 | 4283 |
| 1988 | 10 | 229 | 2330 | 320 | 416 | 68 | 60 | 110 | 29 | 29 | 3601 |
| 1989 | 0 | 314 | 281 | 908 | 123 | 177 | 31 | 23 | 37 | 18 | 1912 |
| 1990 | 7 | 340 | 1776 | 619 | 802 | 95 | 102 | 8 | 14 | 30 | 3793 |
| 1991 | 11 | 493 | 512 | 1242 | 585 | 516 | 74 | 47 | 15 | 20 | 3515 |
| 1992 | 70 | 1784 | 899 | 291 | 544 | 186 | 175 | 25 | 21 | 7 | 4002 |
| 1993 | 4 | 252 | 1069 | 594 | 171 | 244 | 91 | 69 | 17 | 15 | 2526 |
| 1994 | 2 | 140 | 340 | 594 | 213 | 34 | 47 | 22 | 16 | 2 | 1410 |
| 1995 | 0 | 39 | 164 | 64 | 54 | 10 | 2 | 1 | 1 | 0 | 335 |
| 1996 | 1 | 25 | 163 | 269 | 52 | 36 | 9 | 2 | 1 | 0 | 558 |
| 1997 | 3 | 90 | 129 | 251 | 230 | 60 | 26 | 7 | 4 | 1 | 801 |
| 1998 | 0 | 58 | 202 | 97 | 91 | 74 | 13 | 7 | 3 | 2 | 547 |
| 1999 | 1 | 30 | 236 | 170 | 48 | 28 | 23 | 7 | 1 | 3 | 547 |
| 2000 | 0 | 30 | 59 | 231 | 93 | 25 | 15 | 9 | 2 | 1 | 465 |
| 2001 | 0.1 | 10 | 197 | 114 | 210 | 61 | 18 | 9 | 3 | 0 | 622 |
| 2002 | 0 | 3 | 38 | 150 | 42 | 75 | 14 | 5 | 2 | 1 | 330 |
| 2003 | 0.2 | 5 | 67 | 80 | 141 | 28 | 38 | 9 | 2 | 1 | 371 |
| 2004 | 3 | 14 | 132 | 153 | 134 | 129 | 33 | 22 | 4 | 1 | 625 |
| 2005 | 0 | 6 | 12 | 83 | 24 | 18 | 21 | 8 | 4 | 1 | 178 |
| 2006 | 0 | 3 | 113 | 44 | 125 | 32 | 14 | 14 | 2 | 1 | 348 |
| 2007 | 0 | 17 | 29 | 236 | 19 | 57 | 10 | 6 | 6 | 0 | 380 |

Table A9 - continued. Landings at age (thousands of fish; metric tons) and mean weight (kg) at age of Canadian commercial landings of Atlantic cod from the Georges Bank and South stock (NAFO Division 5Z and Subarea 6), 1978-2007.

| Year | Age | | | | | | | | | | | Total |
|---|-----|------|------|------|------|------|------|------|-----|-----|-------|-------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10+ | | |
| <u>Canadian Commercial Landings in Weight (Tons) at Age</u> | | | | | | | | | | | | |
| 1978 | 1 | 84 | 4816 | 1911 | 788 | 470 | 371 | 122 | 113 | 107 | 8783 | |
| 1979 | | 509 | 525 | 2842 | 1398 | 342 | 169 | 105 | 47 | 42 | 5979 | |
| 1980 | 1 | 1042 | 2722 | 692 | 2099 | 809 | 228 | 133 | 177 | 157 | 8060 | |
| 1981 | 2 | 199 | 1433 | 1779 | 704 | 2638 | 801 | 497 | 220 | 224 | 8496 | |
| 1982 | 4 | 1858 | 3165 | 4228 | 3860 | 1074 | 2028 | 914 | 266 | 418 | 17816 | |
| 1983 | 24 | 1084 | 5519 | 3854 | 876 | 335 | 80 | 176 | 147 | 37 | 12132 | |
| 1984 | | 38 | 292 | 1427 | 1620 | 743 | 622 | 202 | 195 | 620 | 5758 | |
| 1985 | 3 | 3019 | 1775 | 1388 | 2370 | 895 | 368 | 369 | 94 | 160 | 10442 | |
| 1986 | 14 | 374 | 3734 | 1458 | 811 | 1565 | 250 | 180 | 89 | 28 | 8503 | |
| 1987 | 9 | 4185 | 1556 | 3302 | 557 | 596 | 1113 | 243 | 189 | 93 | 11842 | |
| 1988 | 8 | 296 | 5867 | 1249 | 2378 | 455 | 555 | 1177 | 334 | 437 | 12757 | |
| 1989 | | 411 | 662 | 3771 | 673 | 1207 | 231 | 247 | 432 | 276 | 7912 | |
| 1990 | 6 | 616 | 5021 | 2290 | 4187 | 632 | 875 | 90 | 183 | 445 | 14345 | |
| 1991 | 12 | 866 | 1425 | 4281 | 2593 | 2885 | 527 | 451 | 127 | 291 | 13457 | |
| 1992 | 80 | 2769 | 2301 | 1038 | 2492 | 1101 | 1245 | 241 | 265 | 138 | 11669 | |
| 1993 | 3 | 392 | 2488 | 1851 | 768 | 1429 | 638 | 623 | 153 | 183 | 8527 | |
| 1994 | 2 | 203 | 817 | 2270 | 1023 | 243 | 370 | 196 | 128 | 23 | 5276 | |
| 1995 | | 57 | 409 | 241 | 286 | 63 | 22 | 10 | 10 | 0 | 1099 | |
| 1996 | 1 | 38 | 384 | 898 | 272 | 229 | 62 | 17 | 11 | 0 | 1912 | |
| 1997 | 3 | 138 | 292 | 821 | 979 | 351 | 213 | 60 | 47 | 13 | 2917 | |
| 1998 | | 86 | 480 | 310 | 389 | 431 | 91 | 58 | 33 | 30 | 1908 | |
| 1999 | 1 | 47 | 540 | 600 | 200 | 177 | 156 | 56 | 9 | 41 | 1825 | |
| 2000 | 0 | 44 | 126 | 710 | 393 | 123 | 93 | 66 | 17 | 13 | 1585 | |
| 2001 | 0 | 15 | 445 | 338 | 840 | 312 | 94 | 72 | 28 | 0 | 2144 | |
| 2002 | | 4 | 86 | 461 | 181 | 379 | 94 | 41 | 18 | 11 | 1275 | |
| 2003 | 0.1 | 7 | 142 | 213 | 529 | 122 | 216 | 62 | 15 | 9 | 1316 | |
| 2004 | 2 | 19 | 268 | 437 | 462 | 589 | 181 | 162 | 39 | 7 | 2166 | |
| 2005 | | 7 | 21 | 210 | 89 | 89 | 108 | 60 | 34 | 12 | 630 | |
| 2006 | 0 | 3 | 212 | 108 | 435 | 148 | 87 | 80 | 13 | 11 | 1097 | |
| 2007 | 0 | 21 | 52 | 579 | 63 | 239 | 63 | 44 | 42 | 4 | 1107 | |

Table A9 - continued. Landings at age (thousands of fish; metric tons) and mean weight (kg) at age of Canadian commercial landings of Atlantic cod from the Georges Bank and South stock (NAFO Division 5Z and Subarea 6), 1978-2007.

| Year | Age | | | | | | | | | | |
|--|-------|-------|-------|-------|-------|-------|--------|--------|--------|--------|-------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10+ | Total |
| Canadian Commercial Landings Mean Weight (kg) at Age | | | | | | | | | | | |
| 1978 | 0.707 | 1.376 | 2.436 | 2.922 | 3.918 | 6.187 | 6.625 | 10.148 | 9.429 | 15.262 | 2.872 |
| 1979 | 0.000 | 1.371 | 1.601 | 3.725 | 4.630 | 6.222 | 9.365 | 11.638 | 11.699 | 14.064 | 3.227 |
| 1980 | 0.567 | 1.343 | 2.426 | 3.235 | 4.997 | 6.468 | 7.119 | 12.135 | 12.652 | 15.721 | 2.958 |
| 1981 | 0.839 | 1.362 | 2.345 | 3.516 | 5.216 | 6.905 | 9.204 | 9.747 | 10.465 | 13.993 | 4.341 |
| 1982 | 0.652 | 1.444 | 2.324 | 3.816 | 5.188 | 6.550 | 9.137 | 9.418 | 12.667 | 16.092 | 3.537 |
| 1983 | 0.904 | 1.457 | 2.203 | 3.180 | 4.357 | 6.203 | 8.042 | 10.368 | 12.222 | 12.270 | 2.535 |
| 1984 | 0.000 | 1.477 | 2.473 | 3.794 | 4.751 | 6.043 | 8.633 | 10.622 | 10.807 | 15.897 | 5.087 |
| 1985 | 0.686 | 1.406 | 1.964 | 3.625 | 4.768 | 6.440 | 8.181 | 9.718 | 10.499 | 14.537 | 2.500 |
| 1986 | 0.723 | 1.572 | 2.877 | 3.952 | 5.592 | 7.179 | 8.612 | 9.453 | 9.934 | 9.437 | 3.623 |
| 1987 | 0.661 | 1.612 | 2.584 | 4.456 | 6.125 | 7.540 | 9.510 | 11.031 | 12.629 | 15.444 | 2.765 |
| 1988 | 0.786 | 1.294 | 2.518 | 3.904 | 5.716 | 6.694 | 9.251 | 10.700 | 11.531 | 15.065 | 3.543 |
| 1989 | 0.000 | 1.310 | 2.356 | 4.153 | 5.471 | 6.820 | 7.459 | 10.757 | 11.680 | 15.356 | 4.138 |
| 1990 | 0.831 | 1.812 | 2.827 | 3.699 | 5.221 | 6.657 | 8.582 | 11.227 | 13.080 | 14.821 | 3.782 |
| 1991 | 1.051 | 1.756 | 2.783 | 3.447 | 4.432 | 5.591 | 7.116 | 9.604 | 8.457 | 14.550 | 3.828 |
| 1992 | 1.148 | 1.552 | 2.559 | 3.568 | 4.581 | 5.921 | 7.112 | 9.626 | 12.603 | 19.714 | 2.916 |
| 1993 | 0.872 | 1.557 | 2.327 | 3.116 | 4.489 | 5.858 | 7.006 | 9.035 | 8.974 | 12.173 | 3.376 |
| 1994 | 0.906 | 1.453 | 2.404 | 3.822 | 4.805 | 7.141 | 7.869 | 8.914 | 7.970 | 11.637 | 3.742 |
| 1995 | 0.906 | 1.472 | 2.495 | 3.759 | 5.298 | 6.313 | 10.903 | 10.181 | 10.175 | | 3.279 |
| 1996 | 1.034 | 1.538 | 2.358 | 3.337 | 5.237 | 6.358 | 6.916 | 8.455 | 10.594 | | 3.427 |
| 1997 | 0.954 | 1.536 | 2.264 | 3.269 | 4.257 | 5.855 | 8.190 | 8.546 | 11.825 | 12.688 | 3.641 |
| 1998 | 0.626 | 1.484 | 2.375 | 3.195 | 4.274 | 5.828 | 6.991 | 8.298 | 10.984 | 14.840 | 3.487 |
| 1999 | 0.799 | 1.554 | 2.288 | 3.527 | 4.162 | 6.304 | 6.768 | 8.003 | 9.390 | 13.572 | 3.336 |
| 2000 | 0.866 | 1.458 | 2.128 | 3.075 | 4.230 | 4.923 | 6.200 | 7.344 | 8.254 | 12.863 | 3.408 |
| 2001 | 0.880 | 1.468 | 2.261 | 2.963 | 4.001 | 5.119 | 5.219 | 7.967 | 9.218 | | 3.446 |
| 2002 | 0.551 | 1.421 | 2.265 | 3.073 | 4.301 | 5.054 | 6.721 | 8.277 | 8.790 | 10.755 | 3.863 |
| 2003 | 0.524 | 1.344 | 2.119 | 2.658 | 3.755 | 4.363 | 5.693 | 6.902 | 7.610 | 9.391 | 3.546 |
| 2004 | 0.700 | 1.370 | 2.032 | 2.852 | 3.450 | 4.570 | 5.500 | 7.350 | 9.030 | 8.860 | 3.468 |
| 2005 | 0.000 | 1.248 | 1.676 | 2.517 | 3.766 | 4.842 | 5.215 | 7.114 | 8.407 | 9.796 | 3.539 |
| 2006 | 0.048 | 1.102 | 1.872 | 2.430 | 3.493 | 4.564 | 6.340 | 5.917 | 7.321 | 7.646 | 3.156 |
| 2007 | 0.000 | 1.234 | 1.819 | 2.456 | 3.260 | 4.224 | 6.318 | 7.008 | 7.016 | 10.121 | 2.916 |

Table A10. Discards at age (thousands of fish; metric tons) and mean weight (kg) at age of Canadian commercial landings of Atlantic cod from the Georges Bank and South stock (NAFO Division 5Z and Subarea 6), 1978-2007.

| Year | Age | | | | | | | | | | | Total |
|---|------|-------|-------|-------|-------|-------|------|------|------|------|------|-------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10+ | | |
| <u>Canadian Commercial Discards in Numbers (000's) at Age</u> | | | | | | | | | | | | |
| 1978 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 |
| 1979 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 |
| 1980 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 |
| 1981 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 |
| 1982 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 |
| 1983 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 |
| 1984 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 |
| 1985 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 |
| 1986 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 |
| 1987 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 |
| 1988 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 |
| 1989 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 |
| 1990 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 |
| 1991 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 |
| 1992 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 |
| 1993 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 |
| 1994 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 |
| 1995 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0 |
| 1996 | 0.07 | 1.24 | 3.77 | 8.41 | 2.80 | 2.01 | 0.77 | 0.13 | 0.17 | 0.05 | 19 | |
| 1997 | 0.32 | 19.43 | 27.20 | 41.70 | 45.74 | 8.81 | 3.26 | 1.11 | 0.09 | 0.06 | 148 | |
| 1998 | 0.02 | 14.66 | 50.09 | 24.84 | 21.38 | 14.88 | 2.81 | 0.86 | 0.28 | 0.71 | 131 | |
| 1999 | 0.44 | 8.71 | 55.11 | 34.36 | 11.58 | 6.57 | 3.56 | 0.39 | 0.17 | 0.16 | 121 | |
| 2000 | 0.06 | 2.62 | 4.06 | 12.93 | 5.88 | 2.42 | 0.90 | 0.45 | 0.02 | 0.04 | 29 | |
| 2001 | 0.26 | 0.94 | 11.41 | 6.43 | 15.46 | 5.82 | 2.26 | 1.45 | 0.96 | 0.24 | 45 | |
| 2002 | 0.04 | 0.41 | 2.49 | 11.28 | 3.69 | 6.51 | 2.37 | 0.77 | 0.15 | 0.26 | 28 | |
| 2003 | 0.22 | 0.35 | 4.48 | 15.11 | 32.20 | 7.28 | 6.36 | 1.57 | 0.24 | 0.00 | 68 | |
| 2004 | 0.35 | 0.96 | 4.34 | 16.48 | 7.39 | 5.95 | 2.54 | 0.39 | 0.74 | 0.12 | 39 | |
| 2005 | 0.75 | 18.90 | 16.00 | 55.80 | 9.18 | 4.86 | 4.78 | 1.07 | 0.36 | 0.06 | 112 | |
| 2006 | 4.70 | 14.17 | 81.24 | 22.18 | 38.65 | 7.06 | 1.85 | 1.79 | 0.21 | 0.18 | 172 | |
| 2007 | 0.14 | 14.83 | 14.48 | 48.80 | 3.80 | 3.51 | 0.20 | 0.07 | 0.06 | 0.00 | 86 | |

Table A10 - continued. Discards at age (thousands of fish; metric tons) and mean weight (kg) at age of Canadian commercial landings of Atlantic cod from the Georges Bank and South stock (NAFO Division 5Z and Subarea 6), 1978-2007.

| Year | Age | | | | | | | | | | | Total |
|---|-------|-------|--------|--------|--------|-------|-------|-------|-------|-------|-------|-------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10+ | | |
| <u>Canadian Commercial Discards in Weight (Tons) at Age</u> | | | | | | | | | | | | |
| 1978 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0 |
| 1979 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0 |
| 1980 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0 |
| 1981 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0 |
| 1982 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0 |
| 1983 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0 |
| 1984 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0 |
| 1985 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0 |
| 1986 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0 |
| 1987 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0 |
| 1988 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0 |
| 1989 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0 |
| 1990 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0 |
| 1991 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0 |
| 1992 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0 |
| 1993 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0 |
| 1994 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0 |
| 1995 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0 |
| 1996 | 0.01 | 0.70 | 4.76 | 15.03 | 8.13 | 7.78 | 3.35 | 0.63 | 0.89 | 0.29 | 42 | |
| 1997 | 0.29 | 27.18 | 58.04 | 128.85 | 183.58 | 47.02 | 24.65 | 8.94 | 0.48 | 0.36 | 479 | |
| 1998 | 0.02 | 19.24 | 108.09 | 67.43 | 78.89 | 72.05 | 14.48 | 5.66 | 2.43 | 4.07 | 372 | |
| 1999 | 0.34 | 12.40 | 117.57 | 102.09 | 41.01 | 30.44 | 18.73 | 2.94 | 1.26 | 1.54 | 328 | |
| 2000 | 0.01 | 1.47 | 5.12 | 23.09 | 17.05 | 9.36 | 3.87 | 2.22 | 0.11 | 0.18 | 62 | |
| 2001 | 0.03 | 0.53 | 14.40 | 11.49 | 44.86 | 22.52 | 9.78 | 7.13 | 5.12 | 1.04 | 117 | |
| 2002 | 0.01 | 0.23 | 3.14 | 20.15 | 10.69 | 25.22 | 10.25 | 3.79 | 0.78 | 1.62 | 76 | |
| 2003 | 0.03 | 0.20 | 5.66 | 26.99 | 93.42 | 28.21 | 27.48 | 7.76 | 1.30 | 0.00 | 191 | |
| 2004 | 0.05 | 0.54 | 5.48 | 29.43 | 21.43 | 23.03 | 10.97 | 1.92 | 3.95 | 0.74 | 98 | |
| 2005 | 0.09 | 14.06 | 22.90 | 119.13 | 27.88 | 20.19 | 20.14 | 5.42 | 2.74 | 0.43 | 233 | |
| 2006 | 0.64 | 7.64 | 129.95 | 46.36 | 118.36 | 28.35 | 10.90 | 9.99 | 1.37 | 1.45 | 355 | |
| 2007 | 0.02 | 9.91 | 15.09 | 79.45 | 7.90 | 9.91 | 0.92 | 0.44 | 0.33 | 0.00 | 124 | |

Table A10 - continued. Discards at age (thousands of fish; metric tons) and mean weight (kg) at age of Canadian commercial landings of Atlantic cod from the Georges Bank and South stock (NAFO Division 5Z and Subarea 6), 1978-2007.

| Year | Age | | | | | | | | | | Average |
|---|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|---------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10+ | |
| <u>Canadian Commercial Discards Mean Weight (kg) at Age</u> | | | | | | | | | | | |
| 1978 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1979 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1980 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1981 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1982 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1983 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1984 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1985 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1986 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1987 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1988 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1989 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1990 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1991 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1992 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1993 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1994 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1995 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1996 | 0.128 | 0.562 | 1.262 | 1.786 | 2.901 | 3.872 | 4.322 | 4.934 | 5.353 | 5.912 | 2.140 |
| 1997 | 0.907 | 1.399 | 2.134 | 3.090 | 4.014 | 5.339 | 7.561 | 8.049 | 5.353 | 5.913 | 3.245 |
| 1998 | 0.629 | 1.312 | 2.158 | 2.714 | 3.691 | 4.843 | 5.144 | 6.585 | 8.728 | 5.741 | 2.852 |
| 1999 | 0.773 | 1.424 | 2.133 | 2.971 | 3.542 | 4.633 | 5.257 | 7.576 | 7.380 | 9.472 | 2.712 |
| 2000 | 0.128 | 0.562 | 1.262 | 1.786 | 2.901 | 3.872 | 4.322 | 4.934 | 5.353 | 5.159 | 2.128 |
| 2001 | 0.128 | 0.562 | 1.262 | 1.786 | 2.901 | 3.872 | 4.322 | 4.934 | 5.353 | 4.327 | 2.585 |
| 2002 | 0.128 | 0.562 | 1.262 | 1.786 | 2.901 | 3.872 | 4.322 | 4.934 | 5.353 | 6.232 | 2.713 |
| 2003 | 0.128 | 0.562 | 1.262 | 1.786 | 2.901 | 3.872 | 4.322 | 4.934 | 5.353 | 0.000 | 2.817 |
| 2004 | 0.128 | 0.562 | 1.262 | 1.786 | 2.901 | 3.872 | 4.322 | 4.934 | 5.353 | 6.392 | 2.485 |
| 2005 | 0.120 | 0.744 | 1.431 | 2.135 | 3.039 | 4.158 | 4.211 | 5.069 | 7.635 | 7.608 | 2.085 |
| 2006 | 0.135 | 0.539 | 1.600 | 2.090 | 3.063 | 4.013 | 5.902 | 5.586 | 6.520 | 8.014 | 2.064 |
| 2007 | 0.161 | 0.669 | 1.042 | 1.628 | 2.080 | 2.821 | 4.670 | 6.636 | 5.277 | 0.000 | 1.444 |

Table A11. Catch at age (thousands of fish; metric tons) and mean weight (kg) at age of Atlantic cod from the Georges Bank and South stock (NAFO Division 5Z and Subarea 6), 1978-2007.

| Year | Age | | | | | | | | | | |
|--|------|-------|------|------|------|------|-----|-----|-----|-----|-------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10+ | Total |
| <u>Catch in Numbers (000's) at Age</u> | | | | | | | | | | | |
| 1978 | 152 | 417 | 8109 | 2430 | 897 | 178 | 241 | 23 | 42 | 11 | 12499 |
| 1979 | 279 | 2243 | 954 | 4585 | 1207 | 450 | 160 | 304 | 13 | 35 | 10229 |
| 1980 | 340 | 4239 | 5955 | 545 | 2465 | 983 | 418 | 70 | 139 | 14 | 15168 |
| 1981 | 1219 | 3911 | 4738 | 2685 | 318 | 1406 | 417 | 163 | 156 | 66 | 15079 |
| 1982 | 775 | 10457 | 4434 | 2988 | 2040 | 297 | 707 | 199 | 75 | 85 | 22057 |
| 1983 | 626 | 5182 | 8753 | 2680 | 1155 | 746 | 95 | 175 | 68 | 113 | 19593 |
| 1984 | 281 | 1548 | 3486 | 3328 | 924 | 560 | 450 | 59 | 167 | 125 | 10928 |
| 1985 | 176 | 7444 | 2942 | 1690 | 2098 | 496 | 267 | 197 | 28 | 90 | 15428 |
| 1986 | 768 | 1594 | 4576 | 860 | 525 | 615 | 86 | 70 | 56 | 28 | 9179 |
| 1987 | 104 | 7956 | 1515 | 2170 | 300 | 250 | 277 | 56 | 36 | 26 | 12691 |
| 1988 | 325 | 2352 | 8368 | 1074 | 1576 | 224 | 150 | 218 | 46 | 53 | 14386 |
| 1989 | 891 | 2609 | 3033 | 4254 | 383 | 534 | 81 | 51 | 60 | 21 | 11919 |
| 1990 | 72 | 5561 | 5373 | 1964 | 2272 | 231 | 229 | 25 | 23 | 40 | 15791 |
| 1991 | 270 | 1938 | 3486 | 3159 | 1442 | 1088 | 141 | 90 | 27 | 26 | 11667 |
| 1992 | 138 | 4448 | 2273 | 1066 | 1496 | 447 | 355 | 44 | 36 | 10 | 10313 |
| 1993 | 299 | 1535 | 4429 | 1225 | 475 | 536 | 178 | 141 | 43 | 21 | 8883 |
| 1994 | 91 | 605 | 1541 | 1987 | 426 | 98 | 146 | 51 | 31 | 6 | 4981 |
| 1995 | 32 | 649 | 1427 | 670 | 382 | 41 | 21 | 20 | 6 | 1 | 3251 |
| 1996 | 65 | 287 | 987 | 1270 | 256 | 184 | 18 | 12 | 11 | 0 | 3089 |
| 1997 | 126 | 684 | 749 | 1021 | 883 | 148 | 94 | 19 | 10 | 4 | 3738 |
| 1998 | 63 | 919 | 1310 | 494 | 386 | 285 | 40 | 16 | 6 | 3 | 3522 |
| 1999 | 46 | 354 | 2020 | 852 | 287 | 126 | 144 | 22 | 5 | 3 | 3859 |
| 2000 | 113 | 942 | 741 | 1156 | 316 | 88 | 46 | 39 | 4 | 1 | 3446 |
| 2001 | 12 | 720 | 2667 | 752 | 699 | 180 | 55 | 26 | 15 | 1 | 5126 |
| 2002 | 22 | 83 | 1129 | 1505 | 363 | 371 | 85 | 19 | 11 | 6 | 3594 |
| 2003 | 17 | 199 | 403 | 800 | 910 | 156 | 142 | 28 | 7 | 3 | 2665 |
| 2004 | 52 | 79 | 501 | 349 | 394 | 309 | 74 | 53 | 12 | 4 | 1825 |
| 2005 | 12 | 355 | 199 | 577 | 144 | 106 | 85 | 18 | 9 | 4 | 1509 |
| 2006 | 31 | 67 | 827 | 207 | 365 | 71 | 31 | 28 | 4 | 3 | 1635 |
| 2007 | 11 | 526 | 395 | 1176 | 72 | 129 | 16 | 10 | 9 | 1 | 2345 |

Table A11 - continued. Catch at age (thousands of fish; metric tons) and mean weight (kg) at age of Atlantic cod from the Georges Bank and South stock (NAFO Division 5Z and Subarea 6), 1978-2007.

| Year | Age | | | | | | | | | | |
|--------------------------------------|------|-------|-------|-------|-------|-------|------|------|------|-------|-------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10+ | Total |
| <u>Catch in Weight (Tons) at Age</u> | | | | | | | | | | | |
| 1978 | 88 | 522 | 19793 | 8279 | 3600 | 1016 | 1600 | 197 | 418 | 149 | 35661 |
| 1979 | 194 | 3060 | 1804 | 19625 | 5951 | 3227 | 1542 | 3147 | 135 | 476 | 39162 |
| 1980 | 219 | 5990 | 14476 | 1933 | 13759 | 6634 | 3473 | 699 | 1289 | 212 | 48684 |
| 1981 | 716 | 5636 | 11284 | 9478 | 1607 | 10268 | 3661 | 1597 | 2180 | 1,116 | 47543 |
| 1982 | 499 | 14564 | 11262 | 11116 | 10775 | 1954 | 6694 | 1935 | 967 | 1,321 | 61088 |
| 1983 | 423 | 7442 | 20916 | 8984 | 5527 | 4812 | 803 | 1867 | 792 | 1,838 | 53404 |
| 1984 | 152 | 2320 | 8631 | 12207 | 4562 | 3672 | 3934 | 607 | 1852 | 1828 | 39766 |
| 1985 | 142 | 10313 | 6105 | 6287 | 10441 | 3197 | 2204 | 2022 | 326 | 1260 | 42298 |
| 1986 | 518 | 2163 | 11201 | 3106 | 2886 | 4414 | 759 | 700 | 724 | 405 | 26876 |
| 1987 | 60 | 11683 | 3753 | 9052 | 1728 | 1944 | 2470 | 580 | 435 | 406 | 32112 |
| 1988 | 160 | 3244 | 19856 | 3766 | 8527 | 1517 | 1311 | 2274 | 536 | 784 | 41976 |
| 1989 | 387 | 3747 | 6685 | 15879 | 1987 | 3506 | 646 | 511 | 679 | 312 | 34339 |
| 1990 | 38 | 8282 | 13235 | 7018 | 11285 | 1477 | 1928 | 275 | 289 | 586 | 44413 |
| 1991 | 183 | 2983 | 8726 | 11124 | 6935 | 6338 | 1034 | 842 | 264 | 381 | 38810 |
| 1992 | 159 | 6899 | 5505 | 4067 | 6780 | 2708 | 2522 | 418 | 431 | 196 | 29686 |
| 1993 | 85 | 2005 | 9781 | 3953 | 2369 | 3117 | 1313 | 1258 | 479 | 260 | 24620 |
| 1994 | 45 | 736 | 3323 | 7044 | 2037 | 690 | 1049 | 466 | 275 | 89 | 15754 |
| 1995 | 13 | 879 | 2825 | 2492 | 2007 | 306 | 200 | 244 | 75 | 27 | 9068 |
| 1996 | 32 | 414 | 2359 | 4086 | 1249 | 1194 | 145 | 113 | 124 | 2 | 9718 |
| 1997 | 68 | 1002 | 1745 | 3516 | 3560 | 847 | 730 | 153 | 116 | 47 | 11784 |
| 1998 | 39.1 | 1316 | 2963 | 1693 | 1763 | 1590 | 298 | 124 | 66 | 36 | 9888 |
| 1999 | 25.5 | 510 | 4321 | 2861 | 1302 | 738 | 955 | 187 | 48 | 44 | 10991 |
| 2000 | 44 | 1442 | 1768 | 3917 | 1437 | 482 | 324 | 311 | 34 | 13.0 | 9771 |
| 2001 | 7 | 983 | 5899 | 2208 | 2865 | 950 | 328 | 198 | 134 | 13 | 13584 |
| 2002 | 16 | 149 | 2490 | 4483 | 1443 | 1915 | 548 | 150 | 98 | 76 | 11368 |
| 2003 | 10 | 293 | 911 | 2328 | 3520 | 735 | 824 | 195 | 54 | 31 | 8901 |
| 2004 | 19 | 122 | 1173 | 1056 | 1497 | 1476 | 413 | 388 | 102 | 46 | 6292 |
| 2005 | 5 | 377 | 424 | 1775 | 579 | 522 | 467 | 135 | 79 | 42 | 4404 |
| 2006 | 12 | 75 | 1,764 | 647 | 1,347 | 321 | 202 | 182 | 28 | 31 | 4610 |
| 2007 | 4 | 747 | 758 | 3,408 | 261 | 539 | 96 | 72 | 60 | 10 | 5956 |

Table A11 - continued. Catch at age (thousands of fish; metric tons) and mean weight (kg) at age of Atlantic cod from the Georges Bank and South stock (NAFO Division 5Z and Subarea 6), 1978-2007.

| Year | Age | | | | | | | | | | |
|--------------------------------------|-------|-------|-------|-------|-------|-------|-------|--------|--------|--------|----------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10+ | Mean |
| <u>Catch Mean Weight (kg) at Age</u> | | | | | | | | | | | |
| 1978 | 0.579 | 1.251 | 2.441 | 3.407 | 4.014 | 5.696 | 6.645 | 8.708 | 9.936 | 13.887 | 2.853 |
| 1979 | 0.694 | 1.364 | 1.892 | 4.280 | 4.931 | 7.176 | 9.664 | 10.350 | 10.438 | 13.611 | 3.829 |
| 1980 | 0.644 | 1.413 | 2.431 | 3.546 | 5.583 | 6.748 | 8.305 | 9.926 | 9.295 | 14.900 | 3.210 |
| 1981 | 0.587 | 1.441 | 2.381 | 3.529 | 5.055 | 7.303 | 8.780 | 9.800 | 14.018 | 16.799 | 3.153 |
| 1982 | 0.643 | 1.393 | 2.540 | 3.720 | 5.282 | 6.576 | 9.466 | 9.745 | 12.972 | 15.623 | 2.770 |
| 1983 | 0.676 | 1.436 | 2.389 | 3.352 | 4.784 | 6.447 | 8.491 | 10.667 | 11.699 | 16.319 | 2.726 |
| 1984 | 0.540 | 1.499 | 2.476 | 3.668 | 4.937 | 6.554 | 8.738 | 10.309 | 11.093 | 14.643 | 3.639 |
| 1985 | 0.806 | 1.385 | 2.075 | 3.720 | 4.977 | 6.439 | 8.247 | 10.279 | 11.765 | 14.047 | 2.742 |
| 1986 | 0.674 | 1.357 | 2.448 | 3.611 | 5.494 | 7.173 | 8.877 | 9.944 | 12.947 | 14.562 | 2.928 |
| 1987 | 0.582 | 1.468 | 2.476 | 4.171 | 5.768 | 7.777 | 8.908 | 10.336 | 12.027 | 15.642 | 2.530 |
| 1988 | 0.492 | 1.379 | 2.373 | 3.506 | 5.412 | 6.781 | 8.722 | 10.433 | 11.535 | 14.926 | 2.918 |
| 1989 | 0.435 | 1.436 | 2.204 | 3.732 | 5.181 | 6.563 | 7.937 | 9.976 | 11.287 | 14.651 | 2.881 |
| 1990 | 0.531 | 1.489 | 2.463 | 3.573 | 4.967 | 6.402 | 8.404 | 11.191 | 12.425 | 14.512 | 2.813 |
| 1991 | 0.658 | 1.520 | 2.499 | 3.520 | 4.809 | 5.825 | 7.318 | 9.388 | 9.615 | 14.649 | 3.315 |
| 1992 | 0.830 | 1.435 | 2.408 | 3.798 | 4.520 | 6.043 | 7.085 | 9.472 | 11.841 | 18.836 | 2.761 |
| 1993 | 0.284 | 1.306 | 2.208 | 3.227 | 4.984 | 5.820 | 7.378 | 8.922 | 11.135 | 12.228 | 2.772 |
| 1994 | 0.477 | 1.198 | 2.153 | 3.544 | 4.787 | 7.074 | 7.176 | 9.116 | 9.003 | 15.762 | 3.153 |
| 1995 | 0.396 | 1.347 | 1.977 | 3.721 | 5.249 | 7.430 | 9.327 | 12.197 | 11.841 | 19.118 | 2.785 |
| 1996 | 0.487 | 1.442 | 2.391 | 3.218 | 4.875 | 6.496 | 8.101 | 9.699 | 10.974 | 8.621 | 3.145 |
| 1997 | 0.539 | 1.463 | 2.328 | 3.445 | 4.033 | 5.734 | 7.734 | 8.090 | 11.420 | 12.087 | 3.151 |
| 1998 | 0.619 | 1.432 | 2.261 | 3.425 | 4.571 | 5.576 | 7.399 | 7.753 | 11.825 | 12.310 | 2.807 |
| 1999 | 0.534 | 1.431 | 2.137 | 3.355 | 4.543 | 5.867 | 6.641 | 8.406 | 9.562 | 13.201 | 2.844 |
| 2000 | 0.388 | 1.529 | 2.386 | 3.388 | 4.550 | 5.472 | 6.996 | 8.013 | 8.049 | 12.597 | 2.834 |
| 2001 | 0.601 | 1.365 | 2.212 | 2.937 | 4.101 | 5.265 | 5.980 | 7.681 | 9.043 | 9.737 | 2.650 |
| 2002 | 0.490 | 1.316 | 2.105 | 2.957 | 3.949 | 5.156 | 6.475 | 8.000 | 9.248 | 11.708 | 3.070 |
| 2003 | 0.602 | 1.458 | 2.254 | 2.907 | 3.866 | 4.710 | 5.789 | 6.918 | 8.251 | 10.448 | 3.334 |
| 2004 | 0.352 | 1.511 | 2.320 | 3.027 | 3.803 | 4.781 | 5.616 | 7.368 | 8.555 | 10.973 | 3.432 |
| 2005 | 0.431 | 1.035 | 2.102 | 3.068 | 4.003 | 4.925 | 5.467 | 7.497 | 8.786 | 11.370 | 2.891 |
| 2006 | 0.379 | 1.079 | 2.093 | 3.107 | 3.679 | 4.535 | 6.462 | 6.394 | 7.519 | 9.074 | 2.781 |
| 2007 | 0.423 | 1.420 | 1.917 | 2.899 | 3.627 | 4.173 | 5.932 | 6.957 | 6.922 | 9.070 | 2.539704 |

Table A12. Standardized stratified mean catch per tow in numbers and weight (kg) for Atlantic cod in NEFSC offshore spring and autumn research vessel bottom trawl surveys on Georges Bank (Strata 13-25), 1963 - 2008. [1,2,3].

| Year | Spring | | Autumn | |
|----------------|--------|--------|--------|--------|
| | No/Tow | Wt/Tow | No/Tow | Wt/Tow |
| 1963 | - | - | 4.37 | 17.8 |
| 1964 | - | - | 2.79 | 11.4 |
| 1965 | - | - | 4.25 | 11.8 |
| 1966 | - | - | 4.90 | 8.1 |
| 1967 | - | - | 10.33 | 13.6 |
| 1968 | 4.73 | 12.7 | 3.31 | 8.6 |
| 1969 | 4.63 | 17.8 | 2.24 | 8.0 |
| 1970 | 4.34 | 15.8 | 5.12 | 12.6 |
| 1971 | 3.39 | 14.3 | 3.19 | 9.8 |
| 1972 | 9.16 | 19.3 | 13.09 | 22.9 |
| 1973 | 57.81 | 94.5 | 12.28 | 30.9 |
| 1974 | 14.74 | 36.4 | 3.49 | 8.2 |
| 1975 | 6.89 | 26.1 | 6.41 | 14.1 |
| 1976 | 7.06 | 18.6 | 10.43 | 17.7 |
| 1977 | 6.19 | 15.3 | 5.44 | 12.5 |
| 1978 | 12.31 | 31.2 | 8.59 | 23.3 |
| 1979 | 5.00 | 16.2 | 5.95 | 16.5 |
| 1980 | 7.68 | 24.1 | 2.91 | 6.7 |
| 1981 | 10.44 | 26.1 | 9.20 | 20.3 |
| 1982 | 32.96 | 101.9 | 3.34 | 6.1 |
| 1983 | 7.70 | 23.5 | 4.14 | 6.1 |
| 1984 | 4.08 | 15.3 | 4.73 | 10.0 |
| 1985 | 7.03 | 21.7 | 2.31 | 3.1 |
| 1986 | 5.04 | 16.7 | 2.99 | 3.7 |
| 1987 | 3.24 | 9.9 | 2.33 | 4.4 |
| 1988 | 5.87 | 13.5 | 3.07 | 5.6 |
| 1989 | 4.80 | 10.9 | 4.84 | 4.7 |
| 1990 | 4.79 | 11.7 | 4.78 | 11.5 |
| 1991 | 4.31 | 8.9 | 0.96 | 1.4 |
| 1992 | 2.67 | 7.4 | 1.72 | 3.0 |
| 1993 | 2.40 | 7.0 | 2.15 | 2.2 |
| 1994 | 0.95 | 1.2 | 1.82 | 3.3 |
| 1995 | 3.29 | 8.4 | 3.62 | 5.6 |
| 1996 | 2.70 | 7.5 | 1.10 | 2.7 |
| 1997 | 2.32 | 5.2 | 0.87 | 1.9 |
| 1998 | 4.36 | 11.7 | 1.87 | 2.8 |
| 1999 | 2.15 | 4.7 | 1.02 | 3.0 |
| 2000 | 3.57 | 8.2 | 1.31 | 1.4 |
| 2001 | 1.86 | 5.5 | 1.05 | 2.1 |
| 2002 | 2.08 | 5.0 | 4.70 | 11.3 |
| 2003 | 1.98 | 4.2 | 1.25 | 2.1 |
| 2004 | 5.38 | 14.3 | 4.21 | 5.9 |
| 2005 | 1.96 | 4.5 | 1.02 | 1.6 |
| 2006 | 3.17 | 6.1 | 1.44 | 2.7 |
| 2007 | 3.37 | 5.1 | 0.59 | 1.1 |
| 2008 | 3.57 | 4.3 | | |
| Mean 1963-2008 | 6.9 | 17.4 | 4.0 | 8.5 |

[1] During 1963-1984, BMV oval doors used in spring and autumn surveys; since 1985, Portuguese polyvalent doors used in both surveys. Adjustments have been made to the 1963-1984 catch per tow data to standardize these data to polyvalent door equivalents.

Conversion coefficients of 1.56 (numbers) and 1.62 (weight) were used in this standardization (NEFC 1991).

[2] Spring surveys during 1980-1982, 1989-1991 and 1994 and autumn surveys during 1977-1981, 1989-1991, and 1993 were accomplished with the R/V Delaware II; in all other years, the surveys were accomplished using the R/V Albatross IV. Adjustments have been made to the R/V Delaware II catch per tow data to standardize these to R/V Albatross IV equivalents.

Conversion coefficients of 0.79 (numbers) and 0.67 (weight) were used in this standardization (NEFC 1991)

[3] Spring surveys during 1973-1981 were accomplished with a '41 Yankee' trawl; in all other years, spring surveys were accomplished with a 36 Yankee' trawl. No adjustments have been made to the catch per tow data for these gear differences.

Table A13. Standardized (for vessel and door changes) stratified mean catch per tow at age (numbers) of Atlantic cod in NEFSC offshore spring bottom trawl surveys on Georges Bank (Strata 13-25), 1963 - 2008.

| Year SPRING | AGE | | | | | | | | | | | No./tow |
|-----------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|-------|-------|---------|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10+ | |
| 1968 | 0.513 | 0.136 | 1.615 | 0.825 | 0.665 | 0.385 | 0.246 | 0.140 | 0.083 | 0.056 | 0.058 | 4.722 |
| 1969 | 0.000 | 0.123 | 0.546 | 1.780 | 0.888 | 0.451 | 0.326 | 0.215 | 0.128 | 0.072 | 0.112 | 4.641 |
| 1970 | 0.000 | 0.338 | 0.804 | 0.430 | 1.241 | 0.162 | 0.844 | 0.263 | 0.058 | 0.056 | 0.147 | 4.342 |
| 1971 | 0.000 | 0.206 | 0.860 | 0.438 | 0.254 | 0.570 | 0.114 | 0.324 | 0.365 | 0.128 | 0.132 | 3.391 |
| 1972 | 0.056 | 3.000 | 1.838 | 2.732 | 0.445 | 0.166 | 0.323 | 0.084 | 0.285 | 0.071 | 0.158 | 9.159 |
| 1973 | 0.056 | 0.546 | 42.258 | 6.344 | 6.387 | 0.657 | 0.515 | 0.367 | 0.058 | 0.217 | 0.404 | 57.808 |
| 1974 | 0.000 | 0.444 | 4.558 | 5.971 | 0.761 | 1.988 | 0.442 | 0.100 | 0.265 | 0.064 | 0.144 | 14.735 |
| 1975 | 0.000 | 0.064 | 0.327 | 2.092 | 2.941 | 0.377 | 0.744 | 0.084 | 0.115 | 0.147 | 0.000 | 6.890 |
| 1976 | 0.111 | 1.298 | 1.955 | 0.915 | 0.661 | 1.607 | 0.153 | 0.261 | 0.029 | 0.000 | 0.068 | 7.058 |
| 1977 | 0.000 | 0.044 | 3.389 | 1.084 | 0.553 | 0.267 | 0.717 | 0.052 | 0.066 | 0.000 | 0.021 | 6.193 |
| 1978 | 3.312 | 0.372 | 0.192 | 5.531 | 0.972 | 0.778 | 0.142 | 0.712 | 0.065 | 0.141 | 0.096 | 12.312 |
| 1979 | 0.108 | 0.428 | 1.298 | 0.275 | 1.852 | 0.547 | 0.236 | 0.084 | 0.139 | 0.013 | 0.022 | 5.000 |
| 1980 | 0.105 | 0.031 | 2.217 | 2.690 | 0.212 | 1.705 | 0.374 | 0.186 | 0.031 | 0.030 | 0.096 | 7.676 |
| 1981 | 0.301 | 2.302 | 1.852 | 2.811 | 1.685 | 0.106 | 0.879 | 0.258 | 0.132 | 0.000 | 0.113 | 10.438 |
| 1982 | 0.169 | 0.508 | 5.435 | 9.502 | 8.324 | 6.208 | 0.293 | 1.866 | 0.369 | 0.082 | 0.203 | 32.958 |
| 1983 | 0.081 | 0.332 | 1.952 | 3.017 | 0.796 | 0.697 | 0.443 | 0.027 | 0.219 | 0.000 | 0.138 | 7.701 |
| 1984 | 0.000 | 0.402 | 0.431 | 0.761 | 1.238 | 0.422 | 0.400 | 0.209 | 0.000 | 0.215 | 0.000 | 4.078 |
| 1985 | 0.244 | 0.111 | 2.653 | 0.663 | 1.110 | 1.412 | 0.265 | 0.192 | 0.180 | 0.037 | 0.161 | 7.029 |
| 1986 | 0.092 | 0.872 | 0.409 | 1.844 | 0.365 | 0.540 | 0.618 | 0.062 | 0.125 | 0.101 | 0.015 | 5.044 |
| 1987 | 0.000 | 0.020 | 1.613 | 0.378 | 0.763 | 0.062 | 0.179 | 0.136 | 0.033 | 0.027 | 0.025 | 3.235 |
| 1988 | 0.180 | 0.720 | 0.609 | 3.150 | 0.409 | 0.644 | 0.064 | 0.037 | 0.049 | 0.000 | 0.007 | 5.868 |
| 1989 | 0.000 | 0.310 | 1.410 | 0.666 | 1.583 | 0.235 | 0.351 | 0.051 | 0.040 | 0.055 | 0.093 | 4.794 |
| 1990 | 0.042 | 0.173 | 0.922 | 1.737 | 0.674 | 0.912 | 0.130 | 0.143 | 0.013 | 0.016 | 0.027 | 4.790 |
| 1991 | 0.195 | 1.027 | 0.528 | 0.689 | 0.929 | 0.479 | 0.328 | 0.054 | 0.041 | 0.000 | 0.045 | 4.313 |
| 1992 | 0.000 | 0.123 | 1.252 | 0.468 | 0.168 | 0.273 | 0.142 | 0.159 | 0.020 | 0.037 | 0.028 | 2.670 |
| 1993 | 0.110 | 0.009 | 0.399 | 1.306 | 0.205 | 0.090 | 0.138 | 0.029 | 0.034 | 0.021 | 0.055 | 2.396 |
| 1994 | 0.030 | 0.125 | 0.272 | 0.200 | 0.217 | 0.033 | 0.006 | 0.044 | 0.000 | 0.019 | 0.000 | 0.945 |
| 1995 | 0.482 | 0.050 | 0.382 | 0.854 | 0.534 | 0.599 | 0.107 | 0.234 | 0.028 | 0.022 | 0.000 | 3.290 |
| 1996 | 0.000 | 0.073 | 0.214 | 0.736 | 1.247 | 0.174 | 0.209 | 0.028 | 0.018 | 0.000 | 0.000 | 2.699 |
| 1997 | 0.302 | 0.291 | 0.437 | 0.170 | 0.489 | 0.422 | 0.050 | 0.134 | 0.020 | 0.000 | 0.000 | 2.315 |
| 1998 | 0.018 | 0.111 | 0.665 | 1.298 | 0.848 | 0.755 | 0.533 | 0.102 | 0.031 | 0.000 | 0.000 | 4.360 |
| 1999 | 0.067 | 0.212 | 0.291 | 0.609 | 0.510 | 0.238 | 0.119 | 0.064 | 0.031 | 0.007 | 0.000 | 2.148 |
| 2000 | 0.053 | 0.221 | 0.807 | 0.830 | 1.141 | 0.370 | 0.102 | 0.026 | 0.020 | 0.000 | 0.000 | 3.569 |
| 2001 | 0.000 | 0.061 | 0.235 | 0.794 | 0.160 | 0.383 | 0.177 | 0.023 | 0.018 | 0.012 | 0.000 | 1.862 |
| 2002 | 0.018 | 0.065 | 0.093 | 0.383 | 0.993 | 0.239 | 0.225 | 0.039 | 0.000 | 0.000 | 0.028 | 2.083 |
| 2003 | 0.000 | 0.016 | 0.213 | 0.271 | 0.623 | 0.696 | 0.064 | 0.080 | 0.012 | 0.000 | 0.000 | 1.975 |
| 2004 | 0.000 | 0.637 | 0.058 | 0.579 | 1.407 | 1.354 | 0.893 | 0.179 | 0.261 | 0.013 | 0.000 | 5.380 |
| 2005 | 0.0614 | 0.0119 | 0.4838 | 0.1378 | 0.631 | 0.2744 | 0.2053 | 0.1274 | 0.0298 | 0 | 0 | 1.9628 |
| 2006 | 0.0127 | 0.1786 | 0.231 | 1.3059 | 0.3319 | 0.7234 | 0.2128 | 0.1213 | 0.0539 | 0 | 0 | 3.1715 |
| 2007 | 0.000 | 0.125 | 0.639 | 0.3756 | 1.7937 | 0.1809 | 0.2092 | 0.0309 | 0.0181 | 0 | 0 | 3.3724 |
| 2008 | 0.1312 | 0.6326 | 0.8316 | 0.5785 | 0.3513 | 0.9606 | 0.0378 | 0.045 | 0 | 0 | 0 | 0 |
| average | 0.263 | 0.408 | 1.123 | 1.640 | 1.155 | 0.711 | 0.306 | 0.180 | 0.094 | 0.066 | 0.096 | 6.877 |

Table A14. Standardized (for vessel and door changes) stratified mean catch per tow at age (numbers) of Atlantic cod in NEFSC offshore autumn bottom trawl surveys on Georges Bank (Strata 13-25), 1963 - 2007.

| Year | AGE | | | | | | | | | | No./tow |
|---------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|---------|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | |
| AUTUMN | | | | | | | | | | | |
| 1963 | 0.019 | 0.719 | 0.778 | 0.920 | 0.897 | 0.354 | 0.326 | 0.175 | 0.103 | 0.014 | 0.069 |
| 1964 | 0.009 | 0.640 | 0.699 | 0.588 | 0.538 | 0.145 | 0.136 | 0.062 | 0.050 | 0.030 | 0.083 |
| 1965 | 0.173 | 1.299 | 0.998 | 0.707 | 0.484 | 0.167 | 0.179 | 0.112 | 0.081 | 0.023 | 0.023 |
| 1966 | 1.025 | 1.693 | 1.000 | 0.515 | 0.264 | 0.100 | 0.095 | 0.062 | 0.039 | 0.002 | 0.017 |
| 1967 | 0.072 | 7.596 | 1.334 | 0.523 | 0.406 | 0.133 | 0.133 | 0.055 | 0.051 | 0.012 | 0.070 |
| 1968 | 0.070 | 0.314 | 1.611 | 0.783 | 0.271 | 0.073 | 0.067 | 0.027 | 0.023 | 0.008 | 0.048 |
| 1969 | 0.000 | 0.343 | 0.622 | 0.626 | 0.331 | 0.094 | 0.061 | 0.019 | 0.023 | 0.022 | 0.059 |
| 1970 | 0.434 | 1.699 | 1.361 | 0.532 | 0.696 | 0.153 | 0.000 | 0.033 | 0.055 | 0.055 | 0.098 |
| 1971 | 0.400 | 0.602 | 0.617 | 0.408 | 0.310 | 0.478 | 0.164 | 0.042 | 0.090 | 0.000 | 0.075 |
| 1972 | 0.948 | 7.473 | 1.191 | 1.841 | 0.399 | 0.241 | 0.568 | 0.116 | 0.204 | 0.021 | 0.084 |
| 1973 | 0.203 | 1.748 | 6.060 | 1.164 | 2.039 | 0.210 | 0.225 | 0.175 | 0.062 | 0.137 | 0.253 |
| 1974 | 0.461 | 0.410 | 0.667 | 1.509 | 0.161 | 0.089 | 0.112 | 0.000 | 0.059 | 0.021 | 0.000 |
| 1975 | 2.377 | 0.992 | 0.421 | 0.628 | 1.682 | 0.111 | 0.156 | 0.000 | 0.000 | 0.000 | 0.037 |
| 1976 | 0.000 | 6.144 | 2.073 | 0.762 | 0.275 | 0.738 | 0.054 | 0.269 | 0.037 | 0.052 | 0.021 |
| 1977 | 0.152 | 0.237 | 3.434 | 0.691 | 0.253 | 0.173 | 0.394 | 0.007 | 0.027 | 0.000 | 0.077 |
| 1978 | 0.395 | 1.845 | 0.391 | 4.058 | 0.964 | 0.336 | 0.165 | 0.343 | 0.050 | 0.030 | 0.014 |
| 1979 | 0.115 | 1.625 | 1.677 | 0.162 | 1.687 | 0.321 | 0.184 | 0.031 | 0.113 | 0.010 | 0.025 |
| 1980 | 0.280 | 0.820 | 0.564 | 0.774 | 0.053 | 0.265 | 0.057 | 0.067 | 0.027 | 0.000 | 0.000 |
| 1981 | 0.261 | 3.525 | 2.250 | 1.559 | 0.589 | 0.054 | 0.579 | 0.057 | 0.064 | 0.018 | 0.083 |
| 1982 | 0.362 | 0.577 | 1.910 | 0.242 | 0.068 | 0.115 | 0.000 | 0.031 | 0.033 | 0.000 | 0.000 |
| 1983 | 1.283 | 0.850 | 1.089 | 0.740 | 0.069 | 0.033 | 0.004 | 0.010 | 0.015 | 0.000 | 0.044 |
| 1984 | 0.179 | 1.909 | 0.682 | 0.929 | 0.825 | 0.024 | 0.059 | 0.039 | 0.000 | 0.039 | 0.044 |
| 1985 | 1.002 | 0.181 | 0.843 | 0.067 | 0.106 | 0.077 | 0.028 | 0.000 | 0.000 | 0.000 | 0.003 |
| 1986 | 0.076 | 2.279 | 0.129 | 0.329 | 0.008 | 0.049 | 0.073 | 0.016 | 0.000 | 0.007 | 0.022 |
| 1987 | 0.204 | 0.414 | 1.353 | 0.108 | 0.200 | 0.028 | 0.012 | 0.000 | 0.000 | 0.000 | 0.007 |
| 1988 | 0.550 | 0.875 | 0.437 | 0.904 | 0.060 | 0.194 | 0.000 | 0.011 | 0.039 | 0.000 | 0.000 |
| 1989 | 0.251 | 2.798 | 1.046 | 0.161 | 0.507 | 0.055 | 0.015 | 0.007 | 0.000 | 0.000 | 0.000 |
| 1990 | 0.157 | 0.364 | 1.624 | 1.814 | 0.412 | 0.286 | 0.069 | 0.022 | 0.011 | 0.000 | 0.022 |
| 1991 | 0.041 | 0.408 | 0.175 | 0.274 | 0.031 | 0.029 | 0.000 | 0.000 | 0.000 | 0.000 | 0.095 |
| 1992 | 0.035 | 0.412 | 0.949 | 0.174 | 0.100 | 0.044 | 0.010 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1993 | 0.178 | 0.970 | 0.532 | 0.383 | 0.017 | 0.025 | 0.022 | 0.000 | 0.000 | 0.022 | 0.000 |
| 1994 | 0.067 | 0.406 | 0.664 | 0.433 | 0.153 | 0.068 | 0.021 | 0.000 | 0.006 | 0.000 | 0.000 |
| 1995 | 0.160 | 0.245 | 1.811 | 1.249 | 0.087 | 0.054 | 0.011 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1996 | 0.022 | 0.240 | 0.196 | 0.414 | 0.143 | 0.060 | 0.027 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1997 | 0.006 | 0.236 | 0.321 | 0.109 | 0.129 | 0.049 | 0.009 | 0.007 | 0.000 | 0.000 | 0.000 |
| 1998 | 0.070 | 0.336 | 1.026 | 0.352 | 0.041 | 0.035 | 0.004 | 0.000 | 0.004 | 0.000 | 0.000 |
| 1999 | 0.070 | 0.140 | 0.154 | 0.310 | 0.255 | 0.087 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 2000 | 0.020 | 0.571 | 0.538 | 0.071 | 0.079 | 0.031 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| 2001 | 0.028 | 0.047 | 0.381 | 0.459 | 0.059 | 0.055 | 0.008 | 0.008 | 0.000 | 0.000 | 0.000 |
| 2002 | 0.234 | 0.478 | 0.707 | 1.396 | 1.627 | 0.118 | 0.131 | 0.012 | 0.000 | 0.000 | 0.000 |
| 2003 | 0.327 | 0.166 | 0.309 | 0.201 | 0.156 | 0.082 | 0.000 | 0.007 | 0.000 | 0.000 | 0.000 |
| 2004 | 1.685 | 0.745 | 0.136 | 0.710 | 0.252 | 0.322 | 0.252 | 0.065 | 0.020 | 0.000 | 0.000 |
| 2005 | 0.052 | 0.055 | 0.579 | 0.129 | 0.176 | 0.026 | 0.000 | 0.007 | 0.000 | 0.000 | 0.000 |
| 2006 | 0.099 | 0.433 | 0.162 | 0.514 | 0.034 | 0.125 | 0.015 | 0.038 | 0.010 | 0.010 | 0.000 |
| 2007 | 0.075 | 0.115 | 0.207 | 0.050 | 0.130 | 0.006 | 0.007 | 0.000 | 0.000 | 0.000 | 0.000 |
| average | 0.340 | 1.244 | 1.016 | 0.695 | 0.400 | 0.140 | 0.120 | 0.060 | 0.050 | 0.028 | 0.056 |

Table A15. Stratified mean catch per tow at age (numbers) of Atlantic cod in Canadian spring bottom trawl survey, 1986-2008.

| Year | AGE | | | | | | | | | | No./tow |
|----------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10+ | |
| SPRING | | | | | | | | | | | |
| 1986 | 0.60 | 2.27 | 2.81 | 0.37 | 0.65 | 0.44 | 0.26 | 0.04 | 0.07 | 0.03 | 7.54 |
| 1987 | 0.25 | 2.13 | 0.93 | 1.09 | 0.34 | 0.12 | 0.22 | 0.08 | 0.03 | 0.07 | 5.26 |
| 1988 | 0.28 | 1.01 | 4.66 | 0.58 | 1.02 | 0.13 | 0.08 | 0.17 | 0.04 | 0.07 | 8.04 |
| 1989 | 1.63 | 2.78 | 1.38 | 2.85 | 0.36 | 0.42 | 0.05 | 0.10 | 0.12 | 0.06 | 9.75 |
| 1990 | 0.42 | 2.44 | 3.78 | 2.08 | 3.87 | 0.42 | 0.93 | 0.12 | 0.12 | 0.35 | 14.53 |
| 1991 | 1.18 | 1.16 | 1.84 | 2.15 | 1.05 | 1.31 | 0.16 | 0.22 | 0.03 | 0.09 | 9.19 |
| 1992 | 0.11 | 2.86 | 1.77 | 0.80 | 0.98 | 0.60 | 0.43 | 0.12 | 0.07 | 0.02 | 7.76 |
| *1993 | 0.05 | 0.60 | 2.83 | 1.04 | 0.62 | 1.23 | 0.44 | 0.42 | 0.07 | 0.12 | 7.42 |
| *1994 | 0.02 | 0.80 | 0.89 | 1.65 | 0.60 | 0.23 | 0.45 | 0.11 | 0.15 | 0.04 | 4.94 |
| 1995 | 0.07 | 0.67 | 1.50 | 0.86 | 0.60 | 0.19 | 0.04 | 0.05 | 0.02 | 0.02 | 4.02 |
| 1996 | 0.14 | 0.49 | 2.31 | 4.02 | 1.09 | 0.79 | 0.33 | 0.08 | 0.11 | 0.03 | 9.39 |
| 1997 | 0.32 | 0.53 | 0.55 | 1.25 | 1.23 | 0.27 | 0.06 | 0.03 | 0.02 | 0.01 | 4.27 |
| 1998 | 0.01 | 0.67 | 0.95 | 0.35 | 0.35 | 0.28 | 0.07 | 0.02 | 0.00 | 0.02 | 2.72 |
| 1999 | 0.33 | 0.32 | 1.49 | 1.09 | 0.41 | 0.26 | 0.15 | 0.01 | 0.02 | 0.01 | 4.09 |
| 2000 | 0.10 | 0.44 | 1.05 | 3.92 | 1.71 | 0.78 | 0.40 | 0.24 | 0.01 | 0.03 | 8.68 |
| 2001 | 0.00 | 0.06 | 0.64 | 0.42 | 1.11 | 0.52 | 0.26 | 0.17 | 0.16 | 0.06 | 3.40 |
| 2002 | 0.01 | 0.09 | 0.57 | 2.05 | 0.68 | 1.22 | 0.40 | 0.17 | 0.05 | 0.08 | 5.32 |
| 2003 | 0.00 | 0.02 | 0.30 | 0.65 | 1.21 | 0.32 | 0.34 | 0.16 | 0.01 | 0.00 | 3.01 |
| 2004 | 0.54 | 0.10 | 0.39 | 0.42 | 0.45 | 0.39 | 0.07 | 0.12 | 0.02 | 0.01 | 2.50 |
| **2005 | 0.02 | 1.34 | 0.47 | 2.91 | 1.13 | 0.51 | 0.41 | 0.01 | 0.05 | 0.01 | 6.86 |
| 2006 | 0.00 | 0.04 | 1.41 | 0.66 | 1.63 | 0.70 | 0.20 | 0.18 | 0.08 | 0.05 | 4.95 |
| 2007 | 0.14 | 0.52 | 0.94 | 2.94 | 0.39 | 0.60 | 0.10 | 0.08 | 0.04 | 0.00 | 5.75 |
| 2008 | 0.01 | 0.32 | 0.90 | 0.59 | 2.18 | 0.14 | 0.28 | 0.03 | 0.00 | 0.01 | 4.47 |
| average | 0.27 | 0.94 | 1.49 | 1.51 | 1.03 | 0.52 | 0.27 | 0.12 | 0.06 | 0.05 | 6.41 |

* not used in VPA calibration; entire Bank not surveyed

**R/V Teleost (R/V Needler indices not used since entire GB not surveyed)

| | | | | | | | | | | | |
|----------------|------|------|------|-------|------|------|------|------|------|------|-------|
| R/V Needler'05 | 0.05 | 2.04 | 2.78 | 14.18 | 3.42 | 1.59 | 1.45 | 0.12 | 0.15 | 0.02 | 25.80 |
|----------------|------|------|------|-------|------|------|------|------|------|------|-------|

Table A16. Selected VPA diagnostics, including predicted beginning year stock numbers for ages 1-8 and catchability estimates of each survey index, with standard error and CV for the Georges Bank Atlantic cod stock.

```

Levenburg-Marquardt Algorithm Completed      7 Iterations
Residual Sum of Squares =      381.946

Number of Residuals      =      595
Number of Parameters     =       8
Degrees of Freedom       =      587
Mean Squared Residual   =    0.650675
Standard Deviation       =    0.806644

Number of Years =      30
Number of Ages =      10
First Year =      1978
Youngest Age =      1
Oldest True Age =     9

Number of Survey Indices Available =      30
Number of Survey Indices Used in Estimate = 30

VPA Classic Method - Auto Estimated Q's

Stock Numbers Predicted in Terminal Year Plus One (2008)
Age      Stock Predicted      Std. Error      CV
1        5183.308      0.246857E+04      0.476253E+00
2        5806.732      0.195728E+04      0.337071E+00
3        4336.666      0.134593E+04      0.310361E+00
4        1209.598      0.349681E+03      0.289089E+00
5        4179.574      0.113289E+04      0.271053E+00
6        345.140       0.970113E+02      0.281078E+00
7        554.423       0.167955E+03      0.302937E+00
8        205.361       0.660620E+02      0.321688E+00

Catchability Values for Each Survey Used in Estimate
INDEX      Catchability      Std. Error      CV
1        0.218317E-01      0.431459E-02      0.197629E+00
2        0.915398E-01      0.729253E-02      0.796651E-01
3        0.185267E+00      0.191988E-01      0.103628E+00
4        0.314285E+00      0.444822E-01      0.141535E+00
5        0.400133E+00      0.614341E-01      0.153534E+00
6        0.407756E+00      0.607664E-01      0.149026E+00
7        0.426691E+00      0.760601E-01      0.178256E+00
8        0.519087E+00      0.832176E-01      0.160316E+00
9        0.141338E-01      0.106855E-01      0.756029E+00
10       0.899870E-01      0.208708E-01      0.231931E+00
11       0.198731E+00      0.467107E-01      0.235044E+00
12       0.177261E+00      0.223604E-01      0.126144E+00
13       0.216299E+00      0.540535E-01      0.249901E+00
14       0.207689E+00      0.355707E-01      0.171269E+00
15       0.300243E+00      0.112587E+00      0.374986E+00
16       0.291472E+00      0.165071E+00      0.566335E+00
17       0.208229E-01      0.560922E-02      0.269377E+00
18       0.975199E-01      0.209569E-01      0.214899E+00
19       0.325108E+00      0.337098E-01      0.103688E+00
20       0.610782E+00      0.777510E-01      0.127298E+00
21       0.943304E+00      0.112882E+00      0.119667E+00
22       0.112499E+01      0.189251E+00      0.168225E+00
23       0.121523E+01      0.235266E+00      0.193598E+00
24       0.128776E+01      0.264507E+00      0.205400E+00
25       0.171397E-01      0.364914E-02      0.212906E+00
26       0.743436E-01      0.873116E-02      0.117443E+00
27       0.130644E+00      0.151379E-01      0.115871E+00
28       0.157786E+00      0.227096E-01      0.143927E+00
29       0.122381E+00      0.221607E-01      0.181079E+00
30       0.142723E+00      0.231713E-01      0.162352E+00

```

Table A17. Estimates of beginning year stock size (thousands of fish), instantaneous fishing mortality (F), spawning stock biomass (mt), and female percent mature (5-year moving window) of Georges Bank cod, estimated from virtual population analysis (VPA), calibrated using the commercial catch at age ADAPT formulation, 1978-2007.

Stock Numbers (Jan 1) in thousands

| Age | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | |
|-------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1 | 28705 | 25943 | 22914 | 45891 | 19863 | 11305 | 29021 | 9615 | 44505 | 17898 | 24854 | 17849 | 10204 | 19796 | 7470 | |
| 2 | 4707 | 23365 | 20988 | 18453 | 36471 | 15562 | 8691 | 23506 | 7713 | 35744 | 14560 | 20056 | 13809 | 8290 | 15956 | |
| 3 | 25333 | 3478 | 17107 | 13370 | 11591 | 20473 | 8096 | 5723 | 12569 | 4881 | 22111 | 9803 | 14070 | 6330 | 5023 | |
| 4 | 7660 | 13468 | 1991 | 8669 | 6701 | 5520 | 8936 | 3512 | 2063 | 6191 | 2637 | 10610 | 5305 | 6709 | 2076 | |
| 5 | 2967 | 4093 | 6916 | 1141 | 4688 | 2817 | 2128 | 4336 | 1367 | 920 | 3124 | 1198 | 4880 | 2584 | 2671 | |
| 6 | 1264 | 1624 | 2267 | 3454 | 649 | 2015 | 1273 | 916 | 1678 | 649 | 484 | 1153 | 637 | 1967 | 833 | |
| 7 | 1212 | 874 | 926 | 978 | 1570 | 266 | 982 | 541 | 308 | 823 | 308 | 197 | 467 | 315 | 642 | |
| 8 | 82 | 776 | 572 | 385 | 428 | 654 | 133 | 402 | 205 | 176 | 425 | 118 | 88 | 178 | 132 | |
| 9 | 174 | 47 | 363 | 405 | 169 | 173 | 378 | 56 | 153 | 105 | 93 | 154 | 51 | 50 | 66 | |
| 10+ | 44 | 127 | 37 | 173 | 192 | 288 | 283 | 182 | 76 | 75 | 105 | 54 | 88 | 47 | 19 | |
| Total | 72148 | 73793 | 74082 | 92919 | 82323 | 59073 | 59920 | 48789 | 70638 | 67462 | 68702 | 61191 | 49599 | 46266 | 34887 | |
| Age | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 |
| 1 | 9874 | 6320 | 3931 | 6678 | 10683 | 5031 | 12559 | 6347 | 2982 | 5416 | 1989 | 13591 | 2959 | 7213 | 7104 | 5183 |
| 2 | 5943 | 7814 | 5089 | 3189 | 5409 | 8632 | 4062 | 10240 | 5094 | 2431 | 4404 | 1613 | 11079 | 2412 | 5876 | 5807 |
| 3 | 8749 | 3487 | 5843 | 3578 | 2352 | 3811 | 6239 | 3004 | 7533 | 3522 | 1888 | 3424 | 1248 | 8742 | 1912 | 4337 |
| 4 | 2070 | 3214 | 1476 | 3500 | 2044 | 1253 | 1946 | 3295 | 1794 | 3778 | 1823 | 1182 | 2348 | 840 | 6397 | 1210 |
| 5 | 745 | 607 | 868 | 610 | 1728 | 763 | 584 | 831 | 1661 | 796 | 1736 | 777 | 655 | 1402 | 501 | 4180 |
| 6 | 853 | 189 | 121 | 369 | 270 | 628 | 281 | 222 | 398 | 735 | 326 | 610 | 285 | 406 | 819 | 345 |
| 7 | 283 | 223 | 68 | 62 | 138 | 90 | 259 | 118 | 103 | 164 | 271 | 127 | 224 | 139 | 269 | 554 |
| 8 | 209 | 74 | 53 | 36 | 35 | 30 | 37 | 84 | 55 | 36 | 59 | 95 | 39 | 107 | 85 | 205 |
| 9 | 68 | 46 | 15 | 26 | 19 | 12 | 10 | 11 | 34 | 22 | 13 | 23 | 31 | 16 | 62 | 61 |
| 10+ | 34 | 9 | 3 | 1 | 7 | 6 | 7 | 3 | 3 | 13 | 6 | 8 | 13 | 14 | 9 | 51 |
| Total | 28827 | 21982 | 17467 | 18048 | 22685 | 20255 | 25984 | 24154 | 19656 | 16913 | 12514 | 21451 | 18881 | 21292 | 23035 | 21932 |
| Fishing Mortality | | | | | | | | | | | | | | | | |
| Age | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | |
| 1 | 0.01 | 0.01 | 0.02 | 0.03 | 0.04 | 0.06 | 0.01 | 0.02 | 0.02 | 0.01 | 0.01 | 0.06 | 0.01 | 0.02 | 0.03 | |
| 2 | 0.10 | 0.11 | 0.25 | 0.27 | 0.38 | 0.45 | 0.22 | 0.43 | 0.26 | 0.28 | 0.20 | 0.15 | 0.58 | 0.30 | 0.40 | |
| 3 | 0.43 | 0.36 | 0.48 | 0.49 | 0.54 | 0.63 | 0.64 | 0.82 | 0.51 | 0.42 | 0.53 | 0.41 | 0.54 | 0.92 | 0.69 | |
| 4 | 0.43 | 0.47 | 0.36 | 0.41 | 0.67 | 0.75 | 0.52 | 0.74 | 0.61 | 0.48 | 0.59 | 0.58 | 0.52 | 0.72 | 0.82 | |
| 5 | 0.40 | 0.39 | 0.49 | 0.36 | 0.64 | 0.59 | 0.64 | 0.75 | 0.54 | 0.44 | 0.80 | 0.43 | 0.71 | 0.93 | 0.94 | |
| 6 | 0.17 | 0.36 | 0.64 | 0.59 | 0.69 | 0.52 | 0.65 | 0.89 | 0.51 | 0.55 | 0.70 | 0.70 | 0.50 | 0.92 | 0.88 | |
| 7 | 0.25 | 0.22 | 0.68 | 0.63 | 0.68 | 0.49 | 0.69 | 0.77 | 0.36 | 0.46 | 0.76 | 0.60 | 0.77 | 0.67 | 0.92 | |
| 8 | 0.36 | 0.56 | 0.15 | 0.62 | 0.71 | 0.35 | 0.66 | 0.76 | 0.47 | 0.43 | 0.82 | 0.64 | 0.37 | 0.80 | 0.46 | |
| 9 | 0.31 | 0.36 | 0.54 | 0.54 | 0.66 | 0.56 | 0.66 | 0.77 | 0.51 | 0.48 | 0.78 | 0.56 | 0.69 | 0.91 | 0.93 | |
| 10+ | 0.31 | 0.36 | 0.54 | 0.54 | 0.66 | 0.56 | 0.66 | 0.77 | 0.51 | 0.48 | 0.78 | 0.56 | 0.69 | 0.91 | 0.93 | |
| F 5-8 | 0.29 | 0.38 | 0.49 | 0.55 | 0.68 | 0.49 | 0.66 | 0.79 | 0.47 | 0.47 | 0.77 | 0.59 | 0.59 | 0.83 | 0.80 | |
| Age | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | |
| 1 | 0.03 | 0.02 | 0.01 | 0.01 | 0.01 | 0.01 | 0.00 | 0.02 | 0.00 | 0.01 | 0.01 | 0.00 | 0.00 | 0.01 | 0.00 | |
| 2 | 0.33 | 0.09 | 0.15 | 0.10 | 0.15 | 0.12 | 0.10 | 0.11 | 0.17 | 0.05 | 0.05 | 0.06 | 0.04 | 0.03 | 0.10 | |
| 3 | 0.80 | 0.66 | 0.31 | 0.36 | 0.43 | 0.47 | 0.44 | 0.32 | 0.49 | 0.46 | 0.27 | 0.18 | 0.20 | 0.11 | 0.26 | |
| 4 | 1.03 | 1.11 | 0.68 | 0.51 | 0.79 | 0.56 | 0.65 | 0.48 | 0.61 | 0.58 | 0.65 | 0.39 | 0.32 | 0.32 | 0.23 | |
| 5 | 1.17 | 1.41 | 0.66 | 0.61 | 0.81 | 0.80 | 0.77 | 0.54 | 0.61 | 0.69 | 0.85 | 0.80 | 0.28 | 0.34 | 0.17 | |
| 6 | 1.14 | 0.83 | 0.47 | 0.78 | 0.90 | 0.68 | 0.67 | 0.57 | 0.68 | 0.80 | 0.74 | 0.80 | 0.52 | 0.21 | 0.19 | |
| 7 | 1.14 | 1.23 | 0.43 | 0.38 | 1.34 | 0.67 | 0.92 | 0.56 | 0.86 | 0.82 | 0.85 | 0.99 | 0.54 | 0.28 | 0.07 | |
| 8 | 1.30 | 1.38 | 0.53 | 0.43 | 0.89 | 0.88 | 1.03 | 0.70 | 0.72 | 0.85 | 0.73 | 0.92 | 0.70 | 0.34 | 0.14 | |
| 9 | 1.15 | 1.24 | 0.62 | 0.65 | 0.85 | 0.74 | 0.77 | 0.55 | 0.64 | 0.75 | 0.83 | 0.82 | 0.38 | 0.31 | 0.14 | |
| 10+ | 1.15 | 1.24 | 0.62 | 0.65 | 0.85 | 0.74 | 0.77 | 0.55 | 0.64 | 0.75 | 0.83 | 0.82 | 0.38 | 0.31 | 0.14 | |
| F 5-8 | 1.19 | 1.21 | 0.52 | 0.55 | 0.99 | 0.76 | 0.85 | 0.59 | 0.72 | 0.79 | 0.79 | 0.88 | 0.51 | 0.29 | 0.14 | |

Table A17 continued. Estimates of beginning year stock size (thousands of fish), instantaneous fishing mortality (F), spawning stock biomass (mt), and female percent mature (5-year moving window) of Georges Bank cod, estimated from virtual population analysis (VPA), calibrated using the commercial catch at age ADAPT formulation, 1978-2007.

SSB at start of spawning season

| Age | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 |
|--------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1 | 836 | 853 | 856 | 1516 | 656 | 393 | 1230 | 1035 | 3133 | 1306 | 1725 | 803 | 371 | 1107 | 428 |
| 2 | 1503 | 6701 | 7328 | 6250 | 10785 | 5499 | 3999 | 10813 | 4333 | 19363 | 7815 | 9691 | 4488 | 3631 | 6593 |
| 3 | 31517 | 3803 | 21975 | 17270 | 15480 | 27649 | 11557 | 7748 | 18717 | 7186 | 32866 | 14041 | 19881 | 9025 | 7376 |
| 4 | 18567 | 37396 | 4512 | 22002 | 16572 | 13464 | 22981 | 9017 | 4886 | 17298 | 6676 | 27186 | 12810 | 16603 | 5337 |
| 5 | 7977 | 15051 | 29814 | 4352 | 17410 | 10409 | 7522 | 15813 | 5460 | 3771 | 12571 | 4596 | 18059 | 8870 | 8808 |
| 6 | 5197 | 7938 | 11369 | 19342 | 3223 | 10432 | 6181 | 4308 | 8903 | 3748 | 2606 | 5910 | 3262 | 8779 | 3750 |
| 7 | 5990 | 6042 | 6175 | 6557 | 11284 | 1769 | 6347 | 3385 | 2121 | 5890 | 2161 | 1262 | 2952 | 1863 | 3422 |
| 8 | 594 | 5667 | 5289 | 3026 | 3402 | 5999 | 1076 | 3240 | 1659 | 1514 | 3457 | 956 | 756 | 1336 | 982 |
| 9 | 1489 | 407 | 3145 | 4219 | 1655 | 1627 | 3567 | 525 | 1570 | 1023 | 866 | 1468 | 488 | 432 | 572 |
| 10+ | 565 | 1575 | 489 | 2566 | 2600 | 4135 | 3591 | 2170 | 984 | 1051 | 1336 | 701 | 1107 | 577 | 292 |
| Total | 74235 | 85433 | 90951 | 87101 | 83067 | 81375 | 68051 | 58056 | 51766 | 62150 | 72080 | 66616 | 64174 | 52224 | 37561 |
| Age | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
| 1 | 52 | 69 | 32 | 90 | 340 | 178 | 268 | 89 | 94 | 104 | 29 | 188 | 47 | 68 | 67 |
| 2 | 2434 | 1779 | 1923 | 1100 | 2454 | 4022 | 1854 | 4483 | 1743 | 891 | 1178 | 560 | 2313 | 554 | 1517 |
| 3 | 12257 | 4661 | 7924 | 5556 | 3647 | 5825 | 9127 | 4789 | 11481 | 4708 | 2527 | 4907 | 1728 | 10260 | 2266 |
| 4 | 4703 | 7228 | 3604 | 7847 | 4927 | 3116 | 4604 | 7909 | 4106 | 8402 | 3835 | 2742 | 5633 | 1930 | 14532 |
| 5 | 2579 | 1823 | 3246 | 2267 | 5257 | 2563 | 1960 | 2871 | 5405 | 2337 | 4931 | 2187 | 2104 | 4308 | 1579 |
| 6 | 3498 | 945 | 646 | 1830 | 1188 | 2568 | 1258 | 975 | 1680 | 2863 | 1201 | 2221 | 1095 | 1615 | 3008 |
| 7 | 1510 | 1136 | 495 | 438 | 759 | 505 | 1307 | 664 | 494 | 809 | 1242 | 538 | 1015 | 722 | 1332 |
| 8 | 1294 | 465 | 441 | 309 | 235 | 192 | 240 | 529 | 345 | 207 | 339 | 514 | 217 | 580 | 541 |
| 9 | 559 | 328 | 138 | 258 | 169 | 97 | 74 | 79 | 254 | 157 | 86 | 151 | 226 | 109 | 391 |
| 10+ | 327 | 106 | 55 | 5 | 75 | 64 | 77 | 29 | 25 | 134 | 49 | 76 | 133 | 118 | 77 |
| Total | 29212 | 18540 | 18504 | 19700 | 19051 | 19129 | 20770 | 22416 | 25627 | 20613 | 15417 | 14083 | 14510 | 20263 | 25312 |
| Percent mature (females) | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 |
| Age | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 |
| 1 | 8 | 7 | 9 | 9 | 8 | 8 | 13 | 18 | 16 | 20 | 25 | 20 | 12 | 13 | 9 |
| 2 | 33 | 34 | 38 | 38 | 36 | 41 | 49 | 59 | 58 | 59 | 64 | 61 | 46 | 53 | 47 |
| 3 | 75 | 78 | 79 | 79 | 79 | 85 | 87 | 91 | 91 | 89 | 90 | 91 | 85 | 89 | 89 |
| 4 | 95 | 96 | 96 | 96 | 96 | 98 | 98 | 99 | 99 | 98 | 98 | 98 | 97 | 98 | 99 |
| 5 | 99 | 99 | 99 | 99 | 99 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 6+ | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| Age | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
| 1 | 4 | 4 | 4 | 5 | 10 | 9 | 7 | 7 | 8 | 7 | 4 | 7 | 6 | 5 | 4 |
| 2 | 43 | 41 | 50 | 48 | 57 | 56 | 51 | 51 | 50 | 43 | 33 | 38 | 36 | 35 | 37 |
| 3 | 93 | 92 | 96 | 95 | 94 | 94 | 93 | 94 | 93 | 88 | 84 | 83 | 83 | 84 | 89 |
| 4 | 100 | 100 | 100 | 100 | 99 | 100 | 99 | 100 | 99 | 99 | 98 | 98 | 98 | 98 | 99 |
| 5 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 6+ | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |

Table H18. Uncertainty measures of predicted stock size in 2008 (A) and fishing mortality in 2007 (B) for ages 1-10 from 1000 bootstrap replications.

A. Stock Size 2008

| | NLLS Estimate | Bootstrap Mean | Bootstrap Std Error | C.V. For NLLS Soln. |
|-----|-------------------|--------------------|------------------------|-----------------------------------|
| N 1 | 5183. | 6561. | 4776. | 0.7279 |
| N 2 | 5807. | 6299. | 2552. | 0.4052 |
| N 3 | 4337. | 4531. | 1349. | 0.2977 |
| N 4 | 1210. | 1257. | 339. | 0.2700 |
| N 5 | 4180. | 4322. | 1106. | 0.2559 |
| N 6 | 345. | 362. | 101. | 0.2787 |
| N 7 | 554. | 579. | 171. | 0.2950 |
| N 8 | 205. | 212. | 68. | 0.3220 |
| | Bias Estimate | Bias Std. Error | Per Cent Bias | NLLS Estimate |
| | | | | Corrected For Bias |
| N 1 | 1378. | 157. | 26.5855 | 3805. |
| N 2 | 492. | 82. | 8.4716 | 5315. |
| N 3 | 194. | 43. | 4.4784 | 4142. |
| N 4 | 47. | 11. | 3.9107 | 1162. |
| N 5 | 143. | 35. | 3.4188 | 4037. |
| N 6 | 17. | 3. | 4.9578 | 328. |
| N 7 | 24. | 5. | 4.4040 | 530. |
| N 8 | 6. | 2. | 3.0265 | 199. |
| | LOWER 80. % CI | UPPER 80. % CI | | C.V. For Corrected Estimate |
| N 1 | 2275. | 12045. | | 1.2552 |
| N 2 | 3520. | 9480. | | 0.4802 |
| N 3 | 2966. | 6256. | | 0.3256 |
| N 4 | 881. | 1746. | | 0.2919 |
| N 5 | 3063. | 5758. | | 0.2740 |
| N 6 | 245. | 492. | | 0.3078 |
| N 7 | 370. | 811. | | 0.3222 |
| N 8 | 129. | 303. | | 0.3421 |

B. Fishing Mortality (2007)

Bootstrap Output Variable: Fishing Mortality (2007)

| | NLLS Estimate | Bootstrap Mean | Bootstrap Std Error | C.V. For NLLS Soln. |
|--------|-------------------|--------------------|------------------------|---|
| AGE 1 | 0.0016 | 0.0018 | 0.000684 | 0.3891 |
| AGE 2 | 0.1038 | 0.1074 | 0.030121 | 0.2804 |
| AGE 3 | 0.2576 | 0.2630 | 0.061049 | 0.2322 |
| AGE 4 | 0.2257 | 0.2306 | 0.053108 | 0.2303 |
| AGE 5 | 0.1720 | 0.1753 | 0.044752 | 0.2553 |
| AGE 6 | 0.1905 | 0.1976 | 0.057373 | 0.2903 |
| AGE 7 | 0.0688 | 0.0740 | 0.025615 | 0.3463 |
| AGE 8 | 0.1437 | 0.1490 | 0.025656 | 0.1722 |
| AGE 9 | 0.1437 | 0.1490 | 0.025656 | 0.1722 |
| AGE 10 | 0.1437 | 0.1490 | 0.025656 | 0.1722 |
| | Bias Estimate | Bias Std. Error | Per Cent Bias | NLLS Estimate Corrected For Bias |
| AGE 1 | 0.000110 | 0.000022 | 6.6643 | 0.0015 |
| AGE 2 | 0.003611 | 0.000959 | 3.4781 | 0.1002 |
| AGE 3 | 0.005327 | 0.001938 | 2.0676 | 0.2523 |
| AGE 4 | 0.004881 | 0.001687 | 2.1627 | 0.2208 |
| AGE 5 | 0.003353 | 0.001419 | 1.9498 | 0.1686 |
| AGE 6 | 0.007119 | 0.001828 | 3.7374 | 0.1834 |
| AGE 7 | 0.005213 | 0.000827 | 7.5817 | 0.0635 |
| AGE 8 | 0.005229 | 0.000828 | 3.6375 | 0.1385 |
| AGE 9 | 0.005229 | 0.000828 | 3.6375 | 0.1385 |
| AGE 10 | 0.005229 | 0.000828 | 3.6375 | 0.1385 |
| | LOWER 80. % CI | UPPER 80. % CI | | C.V. For Corrected Estimate |
| AGE 1 | 0.00109 | 0.002715 | | |
| AGE 2 | 0.073102 | 0.147959 | | |
| AGE 3 | 0.185357 | 0.338309 | | |
| AGE 4 | 0.168806 | 0.295865 | | |
| AGE 5 | 0.123675 | 0.232908 | | |
| AGE 6 | 0.134014 | 0.272440 | | |
| AGE 7 | 0.047159 | 0.106833 | | |
| AGE 8 | 0.119403 | 0.183809 | | |
| AGE 9 | 0.119403 | 0.183809 | | |
| AGE 10 | 0.119403 | 0.183809 | | |

Table A19. Comparison of Mohn's rho for fishing mortality (F), spawning stock biomass (SSB) and recruitment at age 1, and VPA predicted stock size at age (stk pred) with standard error (std err) and coefficient of variation (cv) and F at age, with average fishing mortality for ages 5-8 (F5-8) for three VPA model formulations.

| Base | | | | | Base Split Surveys | | | | | Round the Corner | | | | | | |
|------|----------|---------|---------|------|--------------------|----------|----------|------|------|------------------|----------|---------|------|------|----------|--|
| | | | | | Mohn's rho | | | | | Mohn's rho | | | | | | |
| | F | SSB | Recruit | | F | SSB | Recruits | | F | SSB | Recruits | | F | SSB | Recruits | |
| age | stk pred | std err | cv | F | age | stk pred | std err | cv | F | age | stk pred | std err | cv | F | | |
| 1 | 5183.3 | 2468.6 | 0.48 | 0 | 1 | 4956.4 | 2221.2 | 0.45 | 0.00 | 1 | 5440.4 | 2496.6 | 0.46 | 0.00 | | |
| 2 | 5806.7 | 1957.3 | 0.34 | 0.1 | 2 | 5849.3 | 1856.8 | 0.32 | 0.11 | 2 | 6090.9 | 1978.8 | 0.32 | 0.10 | | |
| 3 | 4336.7 | 1345.9 | 0.31 | 0.26 | 3 | 3923.7 | 1152.7 | 0.29 | 0.31 | 3 | 4567.7 | 1362.7 | 0.30 | 0.24 | | |
| 4 | 1209.6 | 349.7 | 0.29 | 0.17 | 4 | 992.5 | 279.0 | 0.28 | 0.30 | 4 | 1296.1 | 357.8 | 0.28 | 0.21 | | |
| 5 | 4179.6 | 1132.9 | 0.27 | 0.19 | 5 | 3005.4 | 819.1 | 0.27 | 0.34 | 5 | 4607.1 | 1185.5 | 0.26 | 0.18 | | |
| 6 | 345.1 | 97.0 | 0.28 | 0.07 | 6 | 160.5 | 50.7 | 0.32 | 0.39 | 6 | 333.8 | 94.1 | 0.28 | 0.20 | | |
| 7 | 554.4 | 168.0 | 0.30 | 0.14 | 7 | 239.6 | 87.2 | 0.36 | 0.17 | 7 | 540.3 | 168.4 | 0.31 | 0.06 | | |
| 8 | 205.4 | 66.1 | 0.32 | 0.14 | 8 | 77.4 | 30.6 | 0.39 | 0.30 | 8 | 256.7 | 76.6 | 0.30 | 0.03 | | |
| 9 | 61.0 | | | | 9 | 27.0 | | | | 9 | 286.5 | 90.6 | 0.32 | 0.03 | | |
| 10 | 51.0 | | | | 10 | 22.0 | | | | | | | | | | |
| F5-8 | | 0.14 | | | F5-8 | | 0.30 | | | F5-8 | | 0.11 | | | | |

Table A20. Input data for yield-per-recruit and projection analysis. Selectivity and mean weight estimated as an average of 2003-2007 data, and proportion mature estimated from a five-year moving average, 2004-2008.

| Age | VPA selectivity | Stock weight | Catch weight | Spawning stock weight | Proportion mature |
|------------|----------------------------|-------------------------|-------------------------|----------------------------------|------------------------------|
| 1 | 0.01 | 0.259 | 0.437 | 0.259 | 0.05 |
| 2 | 0.11 | 0.764 | 1.301 | 0.764 | 0.35 |
| 3 | 0.39 | 1.651 | 2.137 | 1.651 | 0.84 |
| 4 | 0.73 | 2.554 | 3.001 | 2.554 | 0.98 |
| 5 | 1.00 | 3.381 | 3.796 | 3.381 | 1.00 |
| 6 | 1.00 | 4.224 | 4.624 | 4.224 | 1.00 |
| 7 | 1.00 | 5.309 | 5.853 | 5.309 | 1.00 |
| 8 | 1.00 | 6.466 | 7.027 | 6.466 | 1.00 |
| 9 | 1.00 | 7.605 | 8.007 | 7.605 | 1.00 |
| 10 | 1.00 | 10.187 | 10.187 | 10.187 | 1.00 |

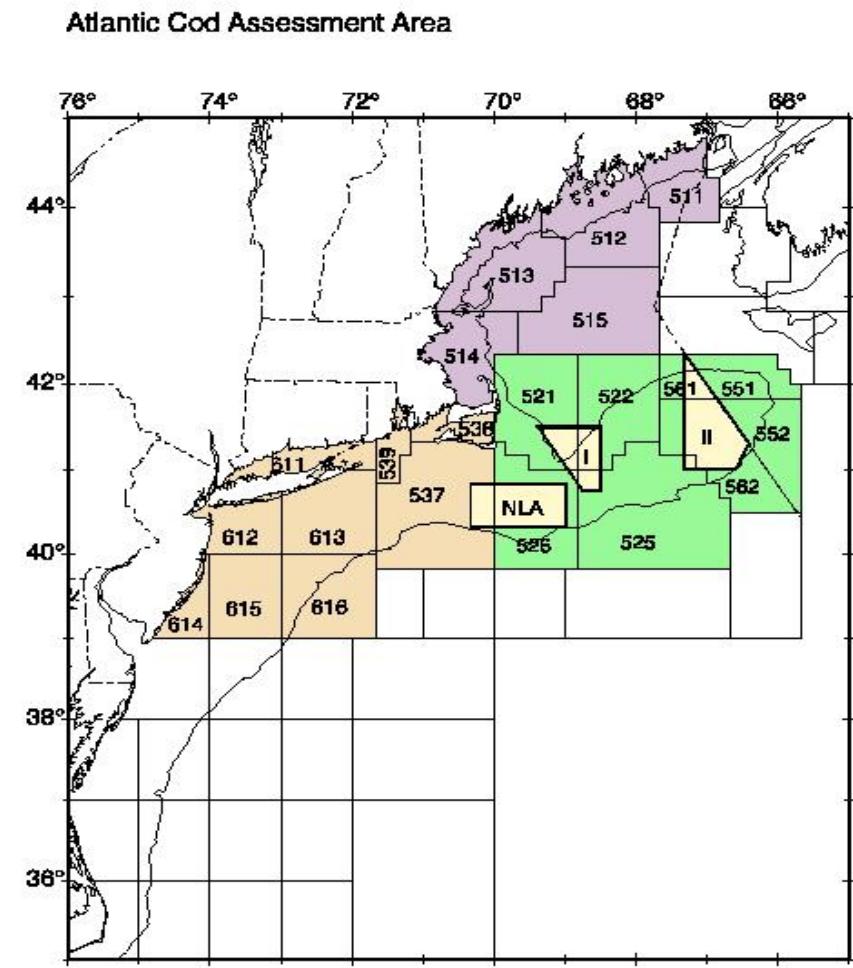


Figure A1. Stock area of Georges Bank cod as defined by Northwest Atlantic Fisheries Organization (NAFO) statistical areas: 521-526, 551-552, 561-562, 537-539, and Subarea 6.

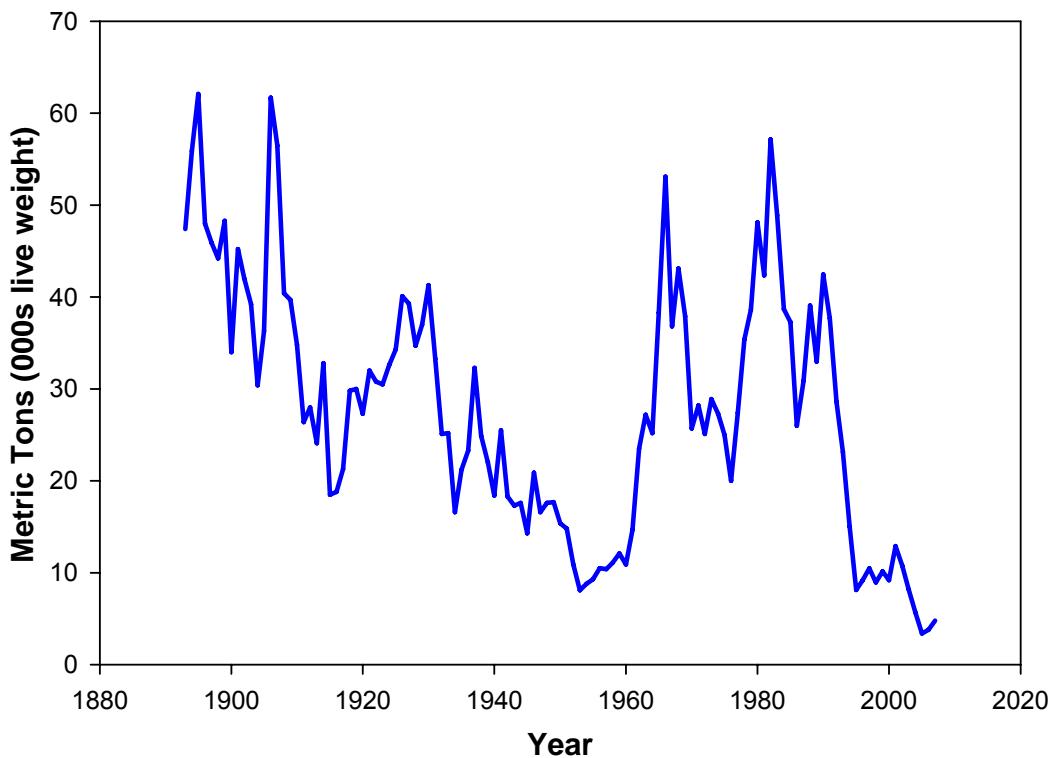


Figure A2a. Total commercial landings of Georges Bank Atlantic cod (NAFO Div. 5Z and SubArea 6, 1893-2007).

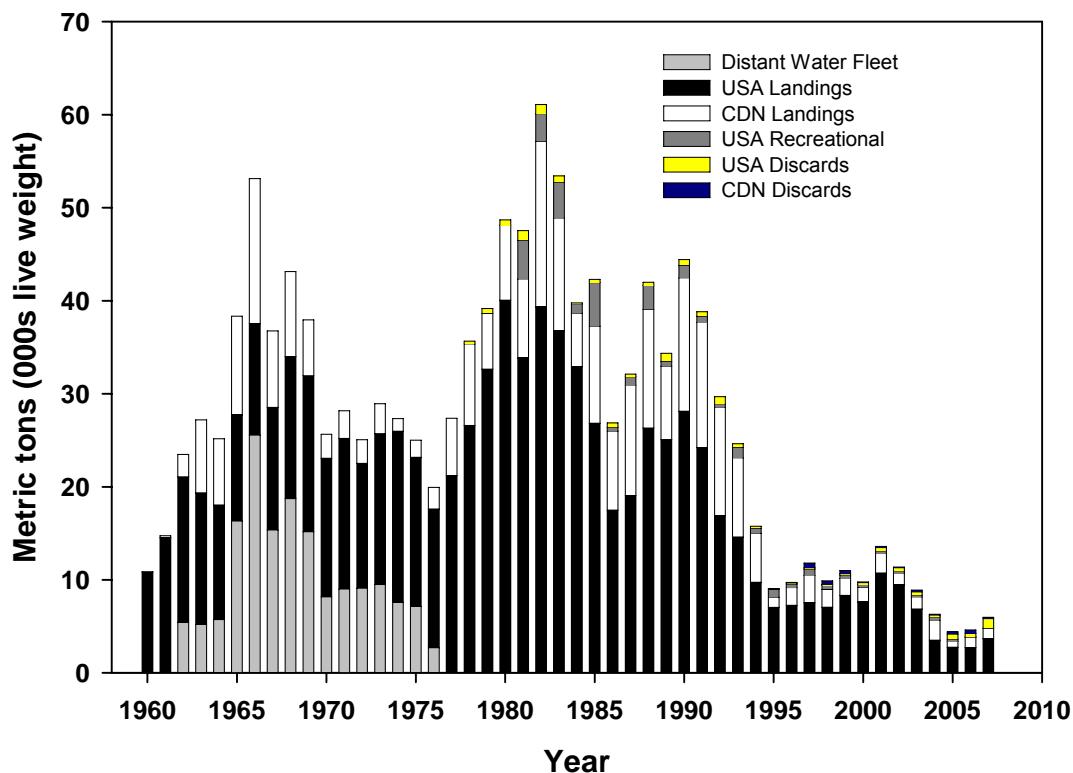


Figure A2b. Total catch of Georges Bank Atlantic cod including USA commercial landings, discards, and recreational landings and Canadian landings and discards, 1960-2007.

Georges Bank Cod Catch at Age

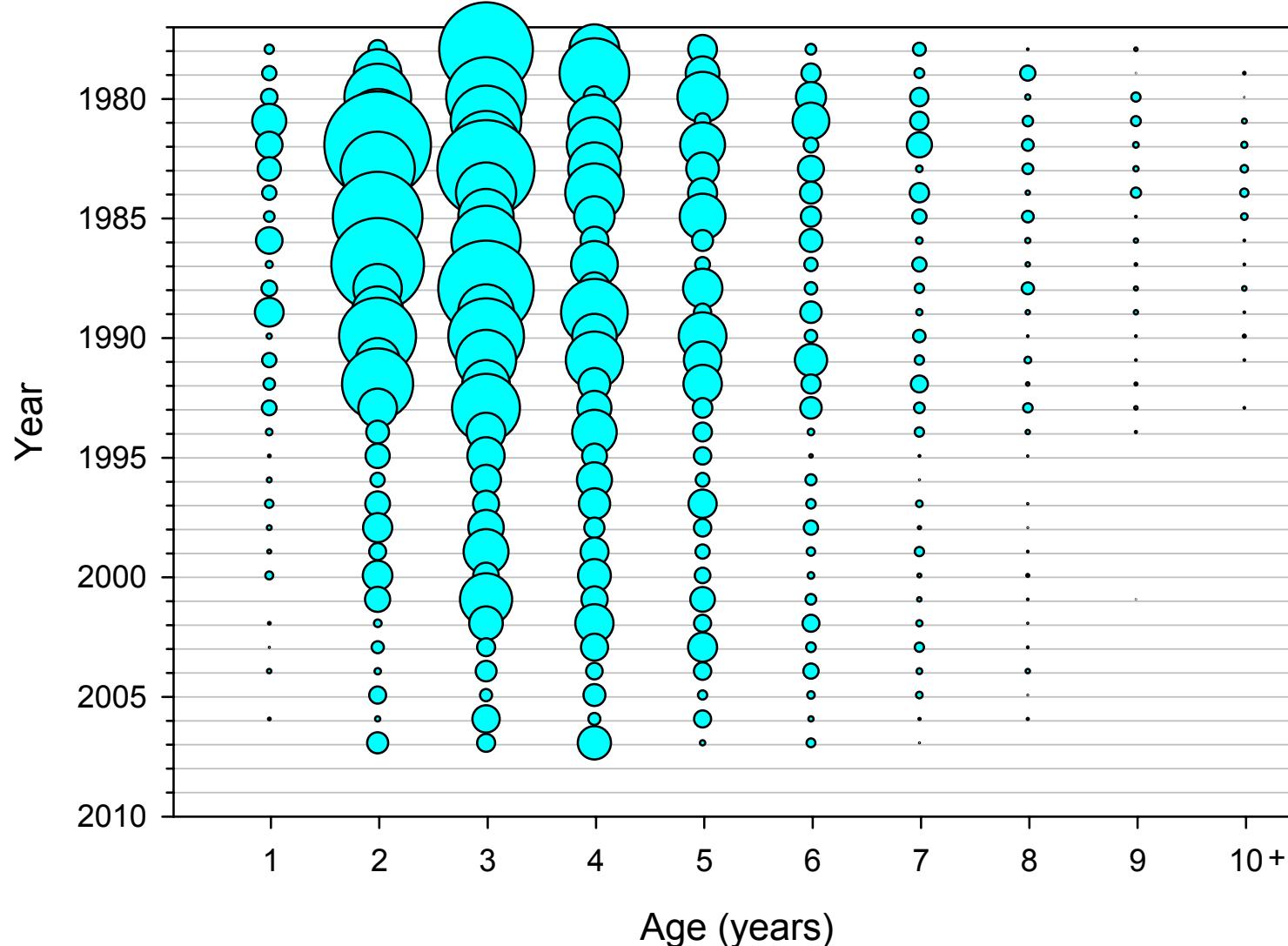


Figure A3. Combined USA and Canadian landings, discards, and USA recreational catch at age (000s fish) for Georges Bank cod, 1978-2007.

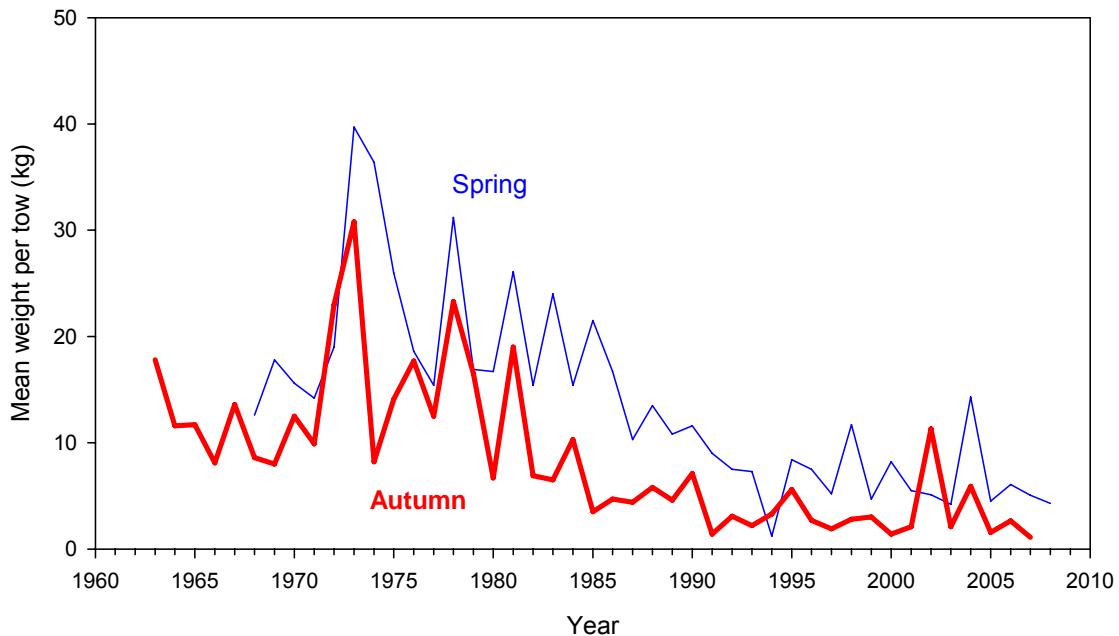


Figure A4. Standardized stratified mean catch per tow (kg) of Atlantic cod in NEFSC spring and autumn research vessel bottom trawl surveys on Georges Bank, 1963-2008.

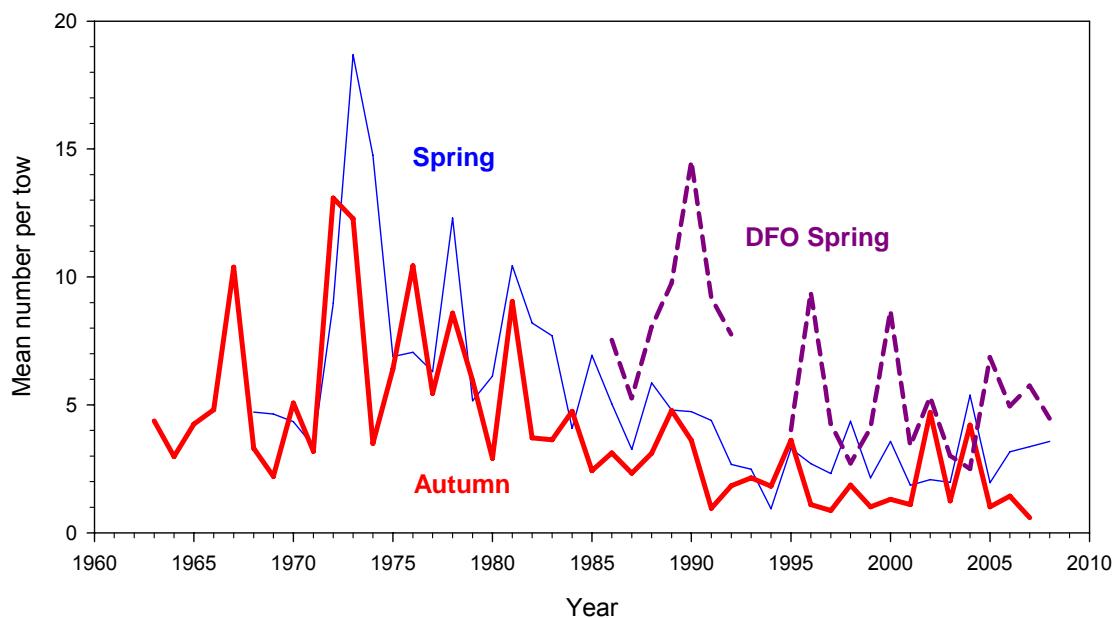


Figure A5. Standardized stratified mean number per tow of Atlantic cod in NEFSC and DFO spring and NEFSC autumn research vessel bottom trawl surveys on Georges Bank, 1963-2008.

Georges Bank Cod Spring Survey Indices by Age

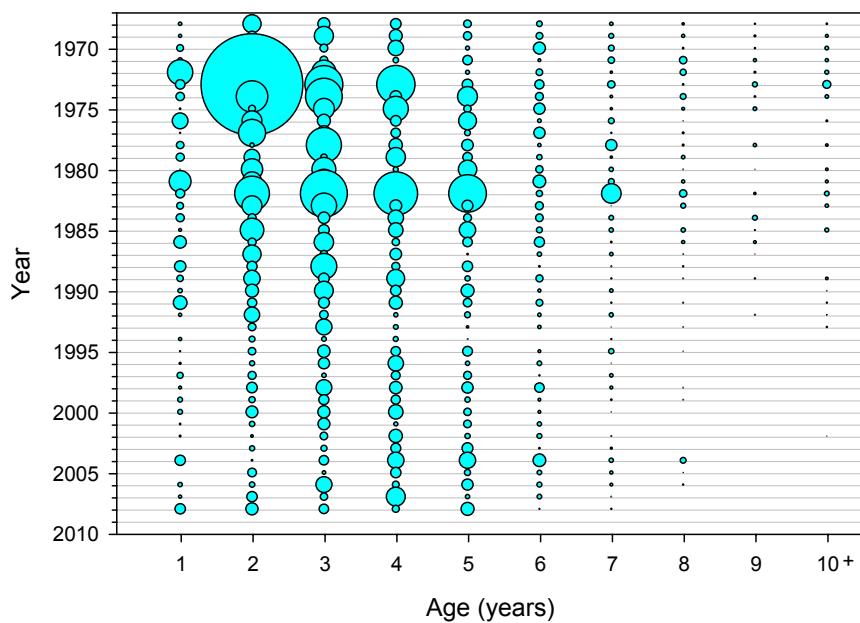


Figure A6. Standardized stratified mean catch per tow at age (numbers) of Georges Bank cod in NEFSC spring bottom trawl surveys, 1968-2008.

Georges Bank Cod DFO Survey Indices by Age

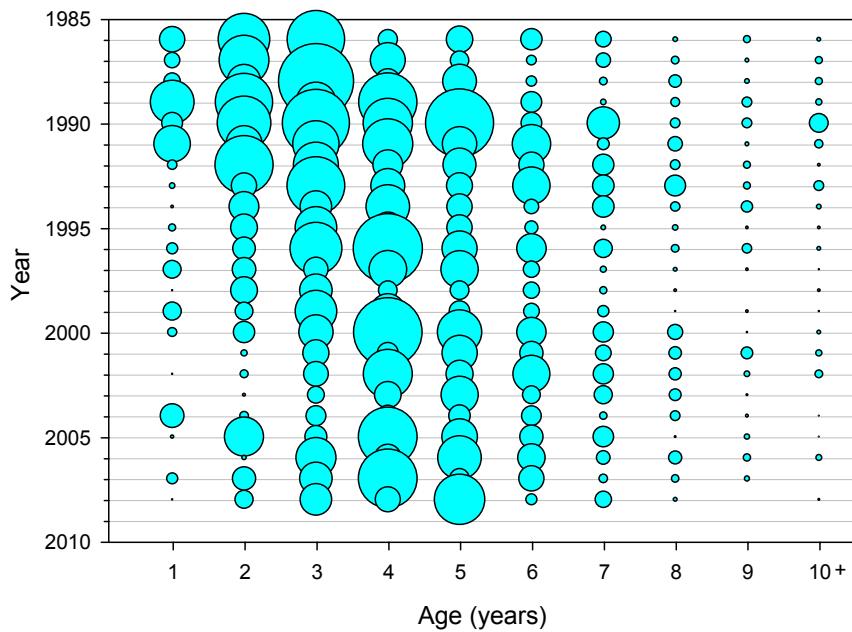


Figure A7. Standardized stratified mean catch per tow at age (numbers) of Georges Bank cod in the DFO spring bottom trawl surveys, 1986-2008.

Georges Bank Cod Autumn Survey Indices by Age

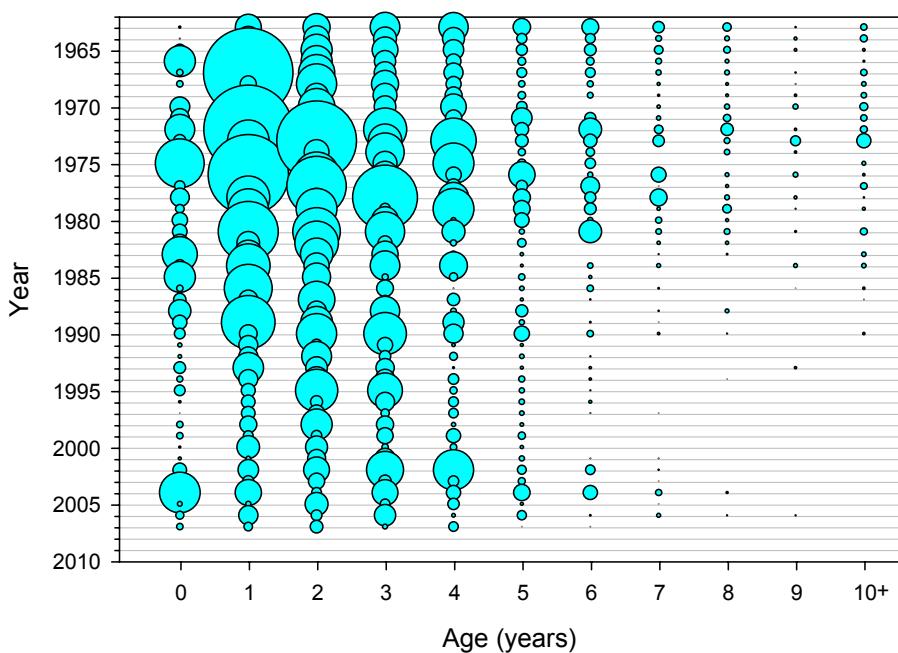


Figure A8. Standardized stratified mean catch per tow at age (numbers) of Georges Bank cod in NEFSC autumn bottom trawl surveys, 1963-2007.

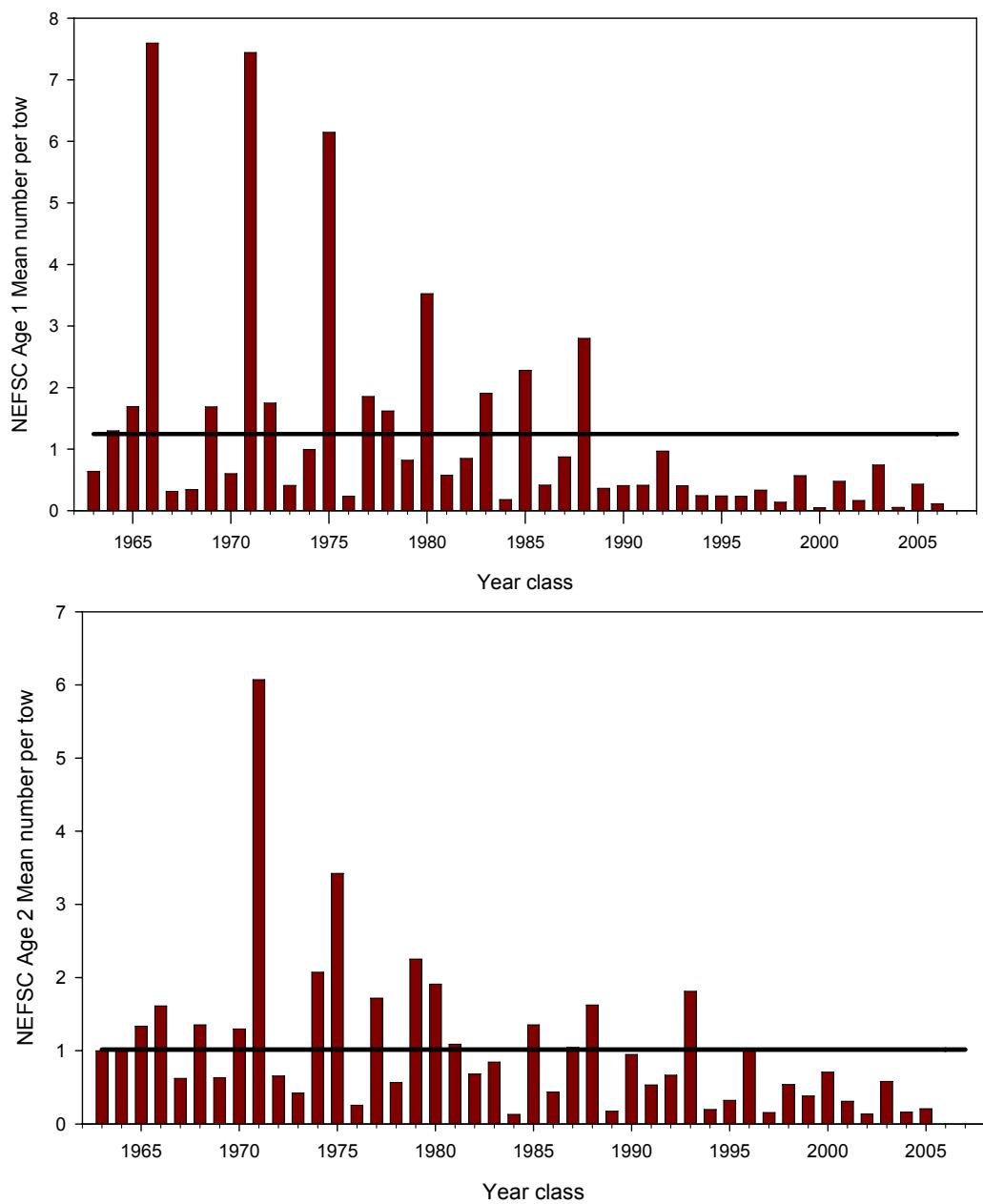


Figure A9. Relative year class strength of age 1 and age 2 Georges Bank cod based on standardized catch (number) per tow indices from NEFSC autumn research vessel bottom trawl surveys, 1963-2007. Horizontal line represents the time series average.

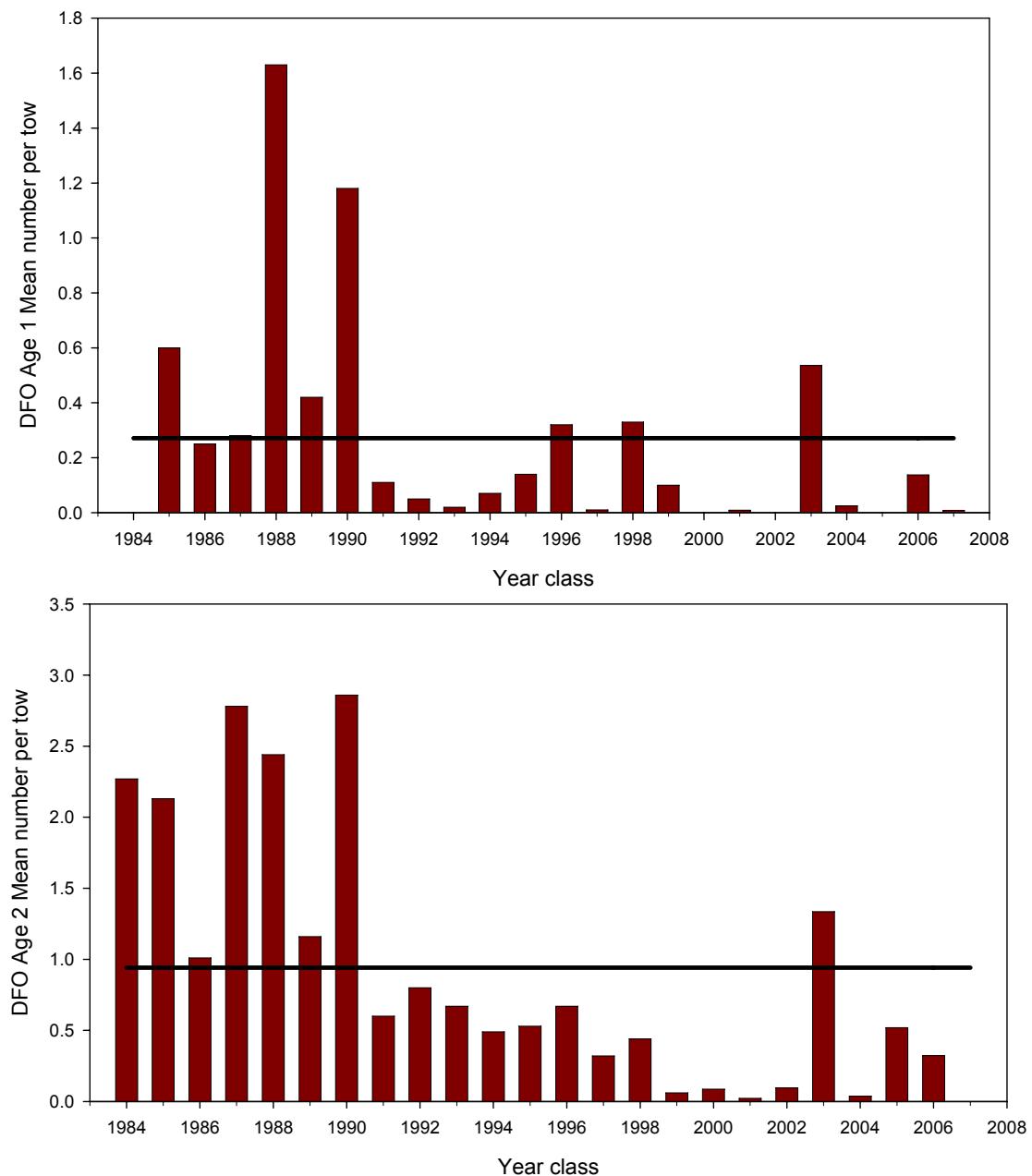


Figure A10. Relative year class strength of age 1 and age 2 Georges Bank cod based on catch (number) per tow indices from DFO spring research vessel bottom trawl surveys, 1986-2007. Horizontal line represents the time series average.

FEMALE Cod Georges Bank maturity at age w/ 95% CI

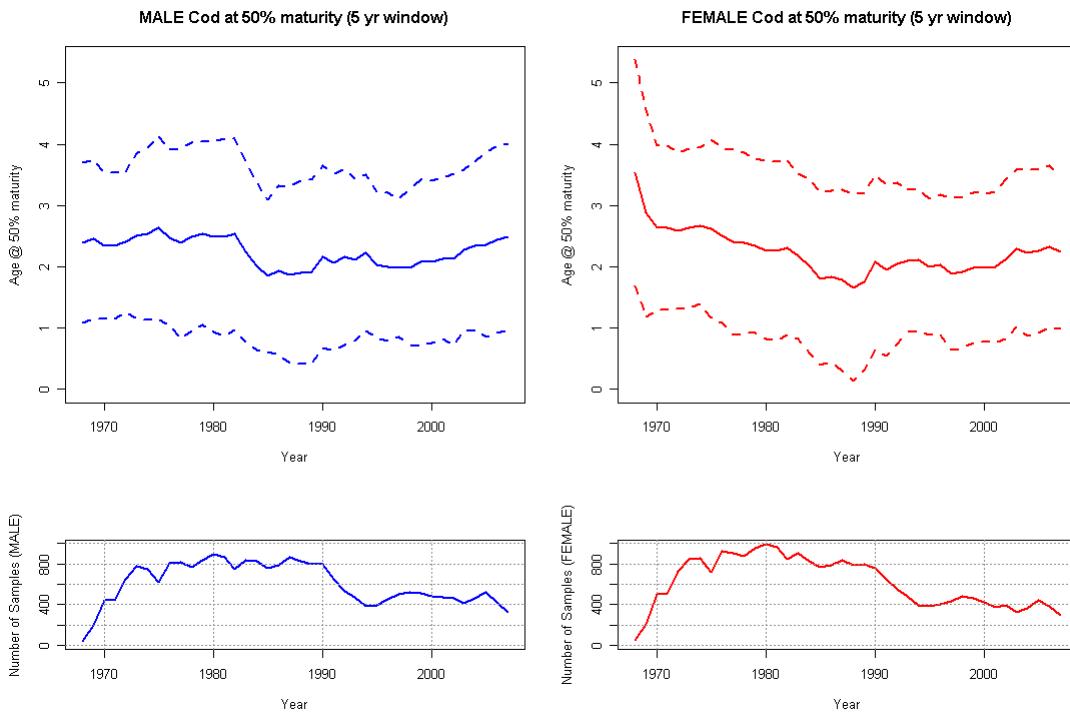
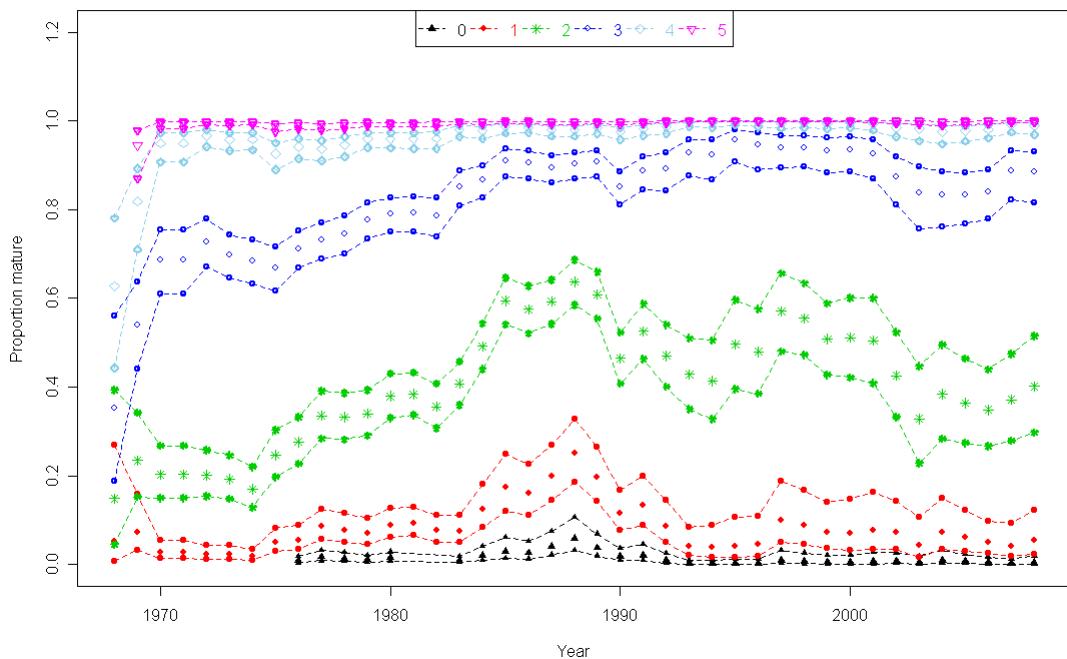


Figure A11. Proportion mature at age with 95% confidence intervals for female Georges Bank cod using a 5-year moving window for ages 1-5 (upper panel), median age at maturity (A_{50}) for males (middle left panel) and females (middle right panel) with 95% confidence intervals, and number of samples in the combined 5-year moving average for males (lower left panel) and females (lower right panel).

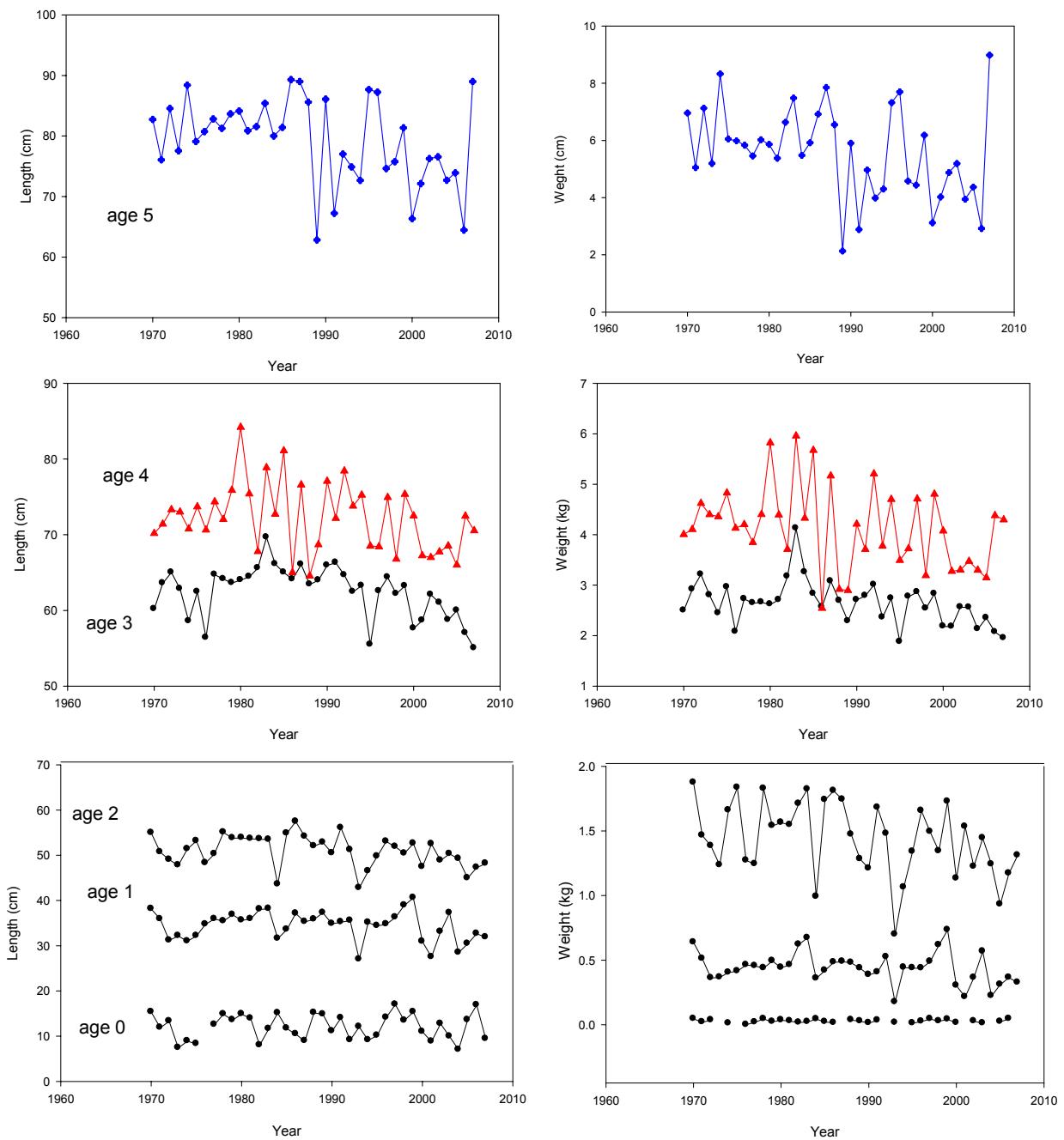


Figure A12. Mean length (left panels) and mean weight (right panels) at ages 0-5 for Georges Bank cod from autumn NEFSC surveys, 1970-2007.

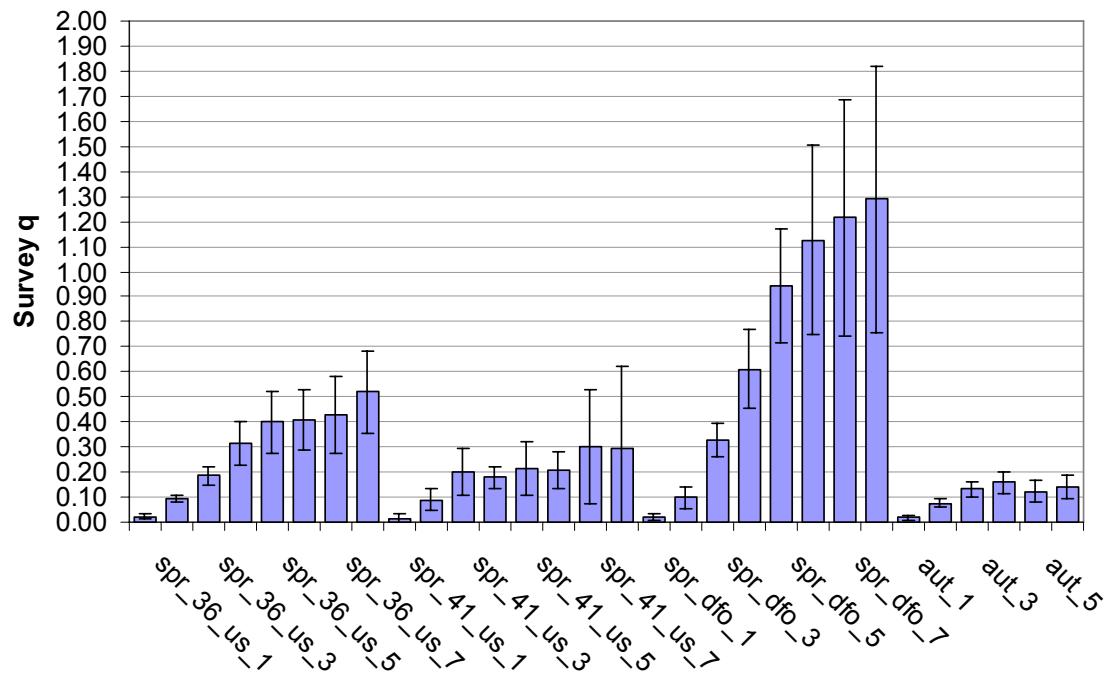


Figure A13. Survey catchability (q) estimates based on swept area estimates of Georges Bank cod in NEFSC and DFO spring and autumn research bottom trawl surveys.

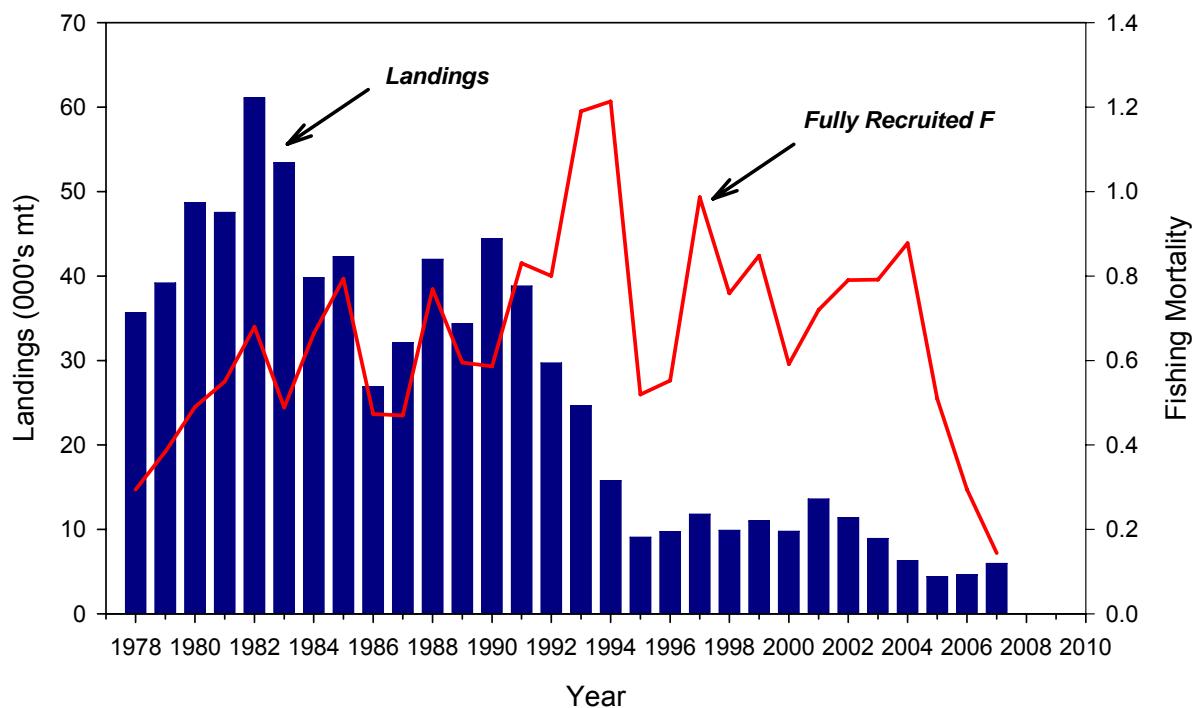


Figure A14. Trends in total catch and fishing mortality (ages 5-8) for Georges Bank cod, 1978-2007.

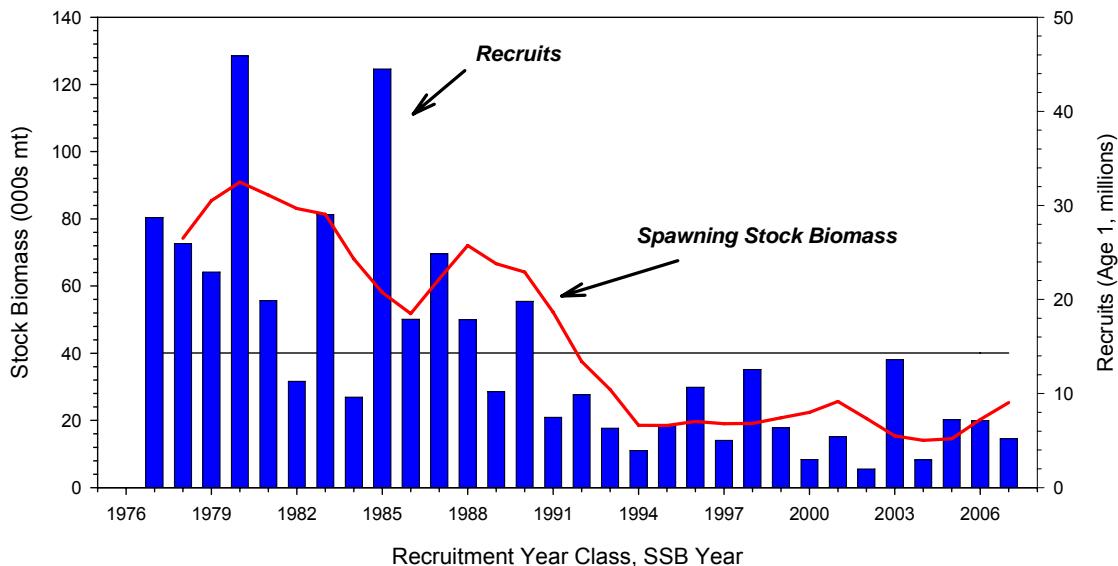


Figure A15. Trends in stock biomass and recruitment for Georges Bank Atlantic cod, 1978-2007.
Horizontal line is the average recruitment for the time series.

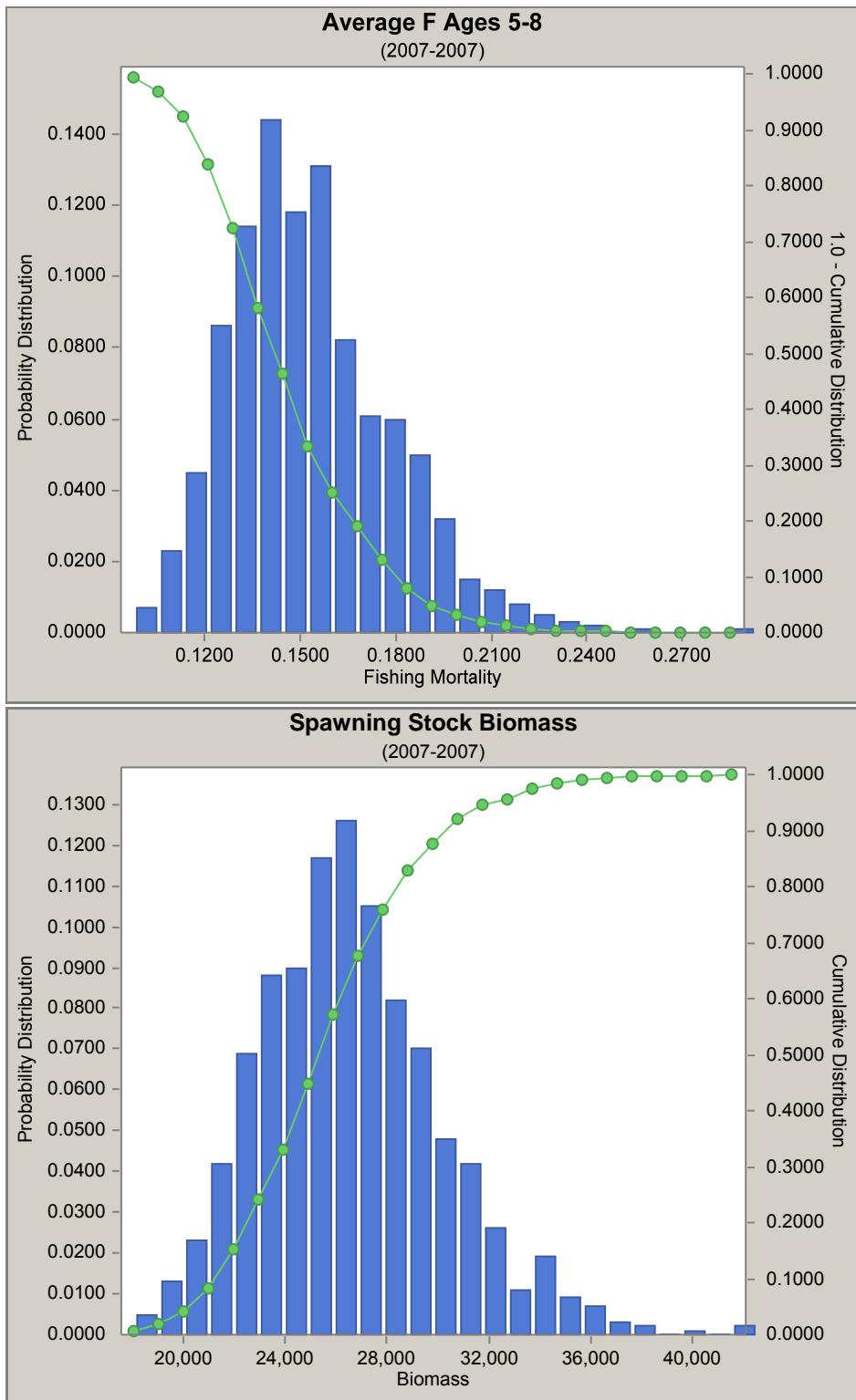


Figure A16. Precision of the estimates of the instantaneous rate of fishing (F) on the fully recruited ages(5-8) and spawning stock biomass at the beginning of the spawning season for Georges Bank Atlantic cod, 2007. Bar height indicates the frequency of values within that range. The solid line is the cumulative probability that F is greater than, or SSB is less than, any selected value on X- axis.

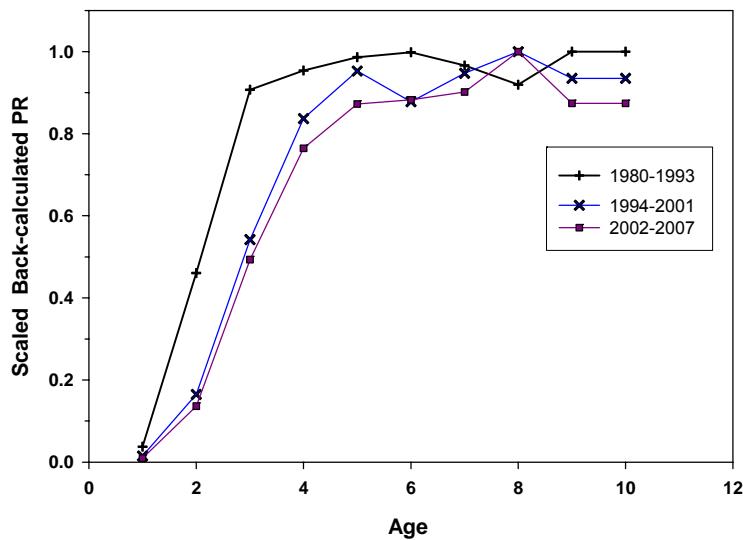


Figure A17. Scaled back-calculated partial recruitment (PR) from VPA for time periods 1980-1993, 1994-2001, and 2002-2007 for Georges Bank Atlantic cod.

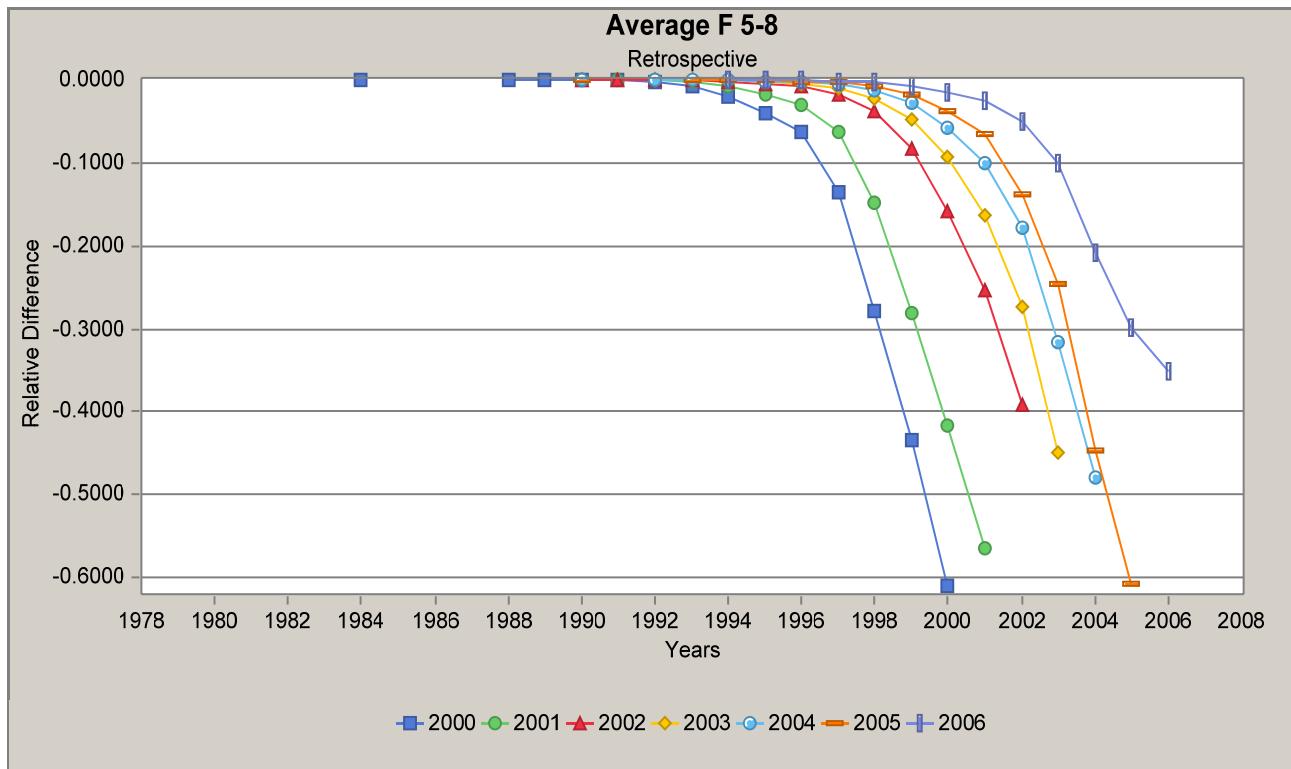


Figure A18a. Retrospective analysis of relative difference to terminal year 2007 of Georges Bank Atlantic cod fishing mortality (ages 5-8, unweighted), based on ADAPT VPA, 2000-2007.

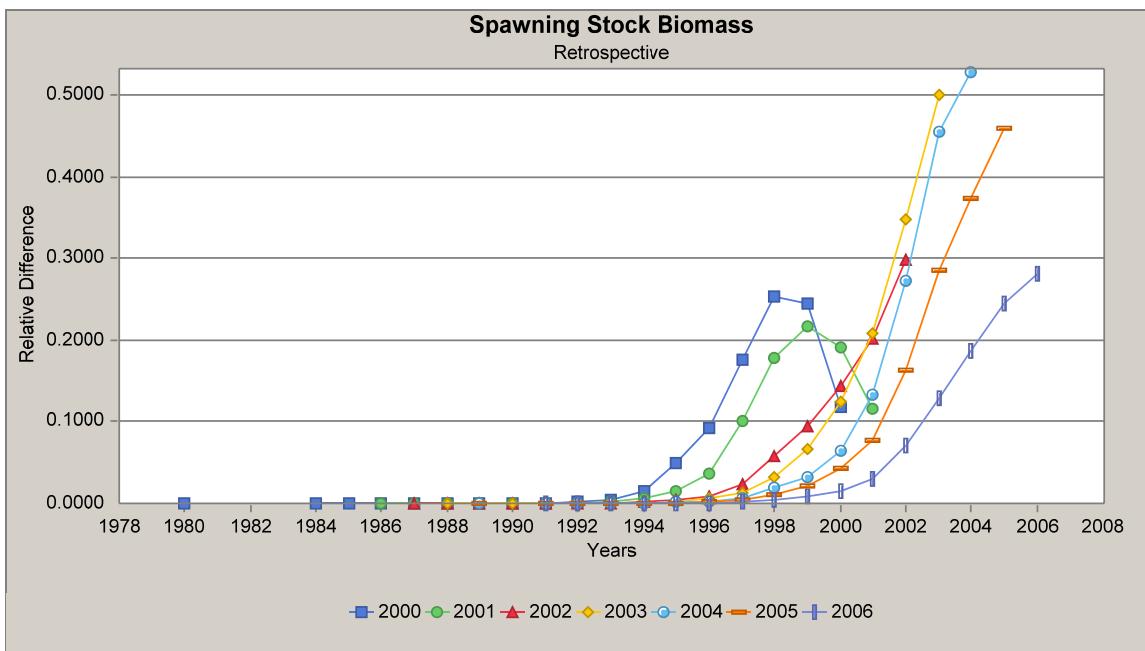


Figure A18b. Retrospective analysis of relative difference to terminal year 2007 of Georges Bank Atlantic cod spawning stock biomass based on ADAPT VPA , 2000-2007.

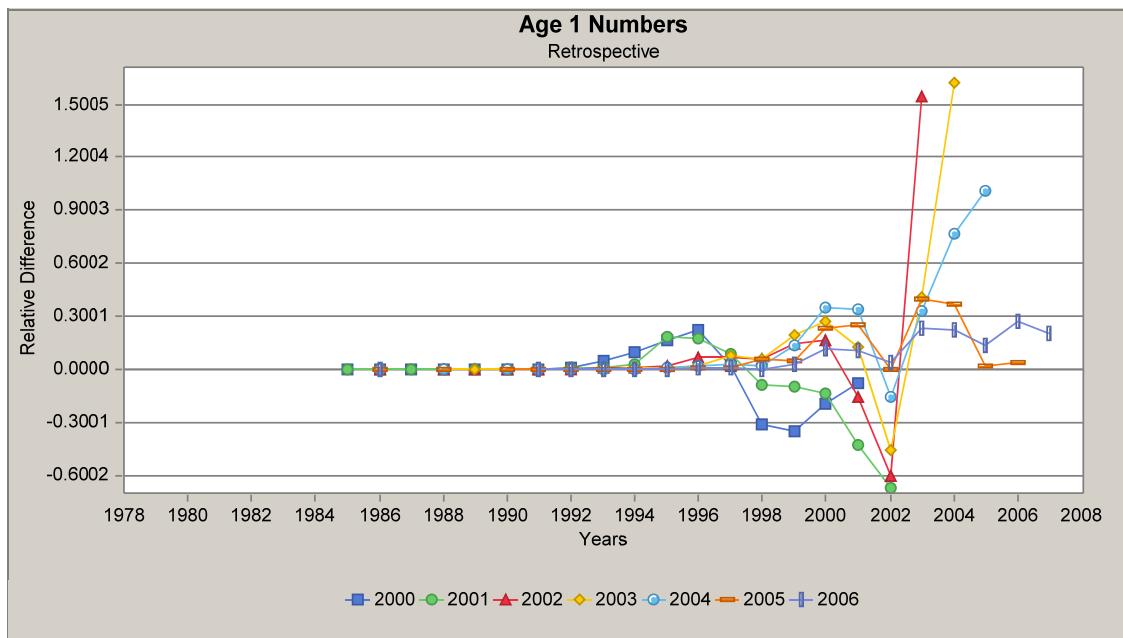


Figure A18c. Retrospective analysis of relative difference to terminal year 2007 of Georges Bank Atlantic cod age 1 recruitment based on ADAPT VPA , 2000-2007.

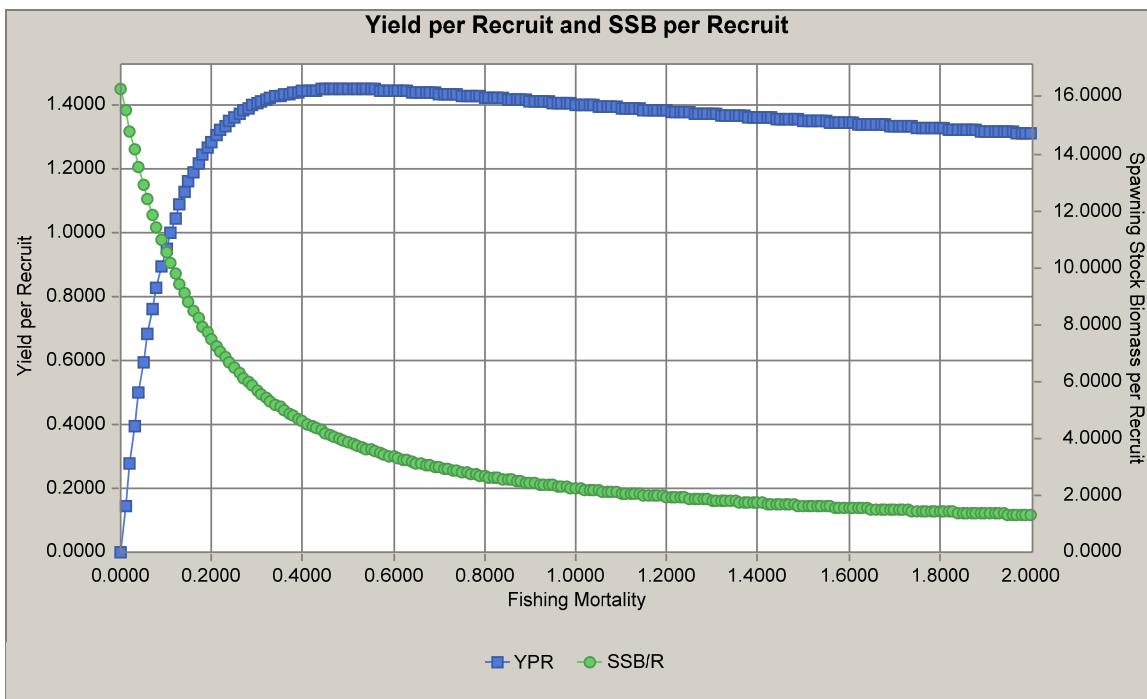


Figure A19.. Yield- and Spawning Stock Biomass per-recruit analysis for Georges Bank Atlantic cod . $F_{0.1} = 0.22$, $F_{\max} = 0.50$ and $F_{40\%} = 0.25$.

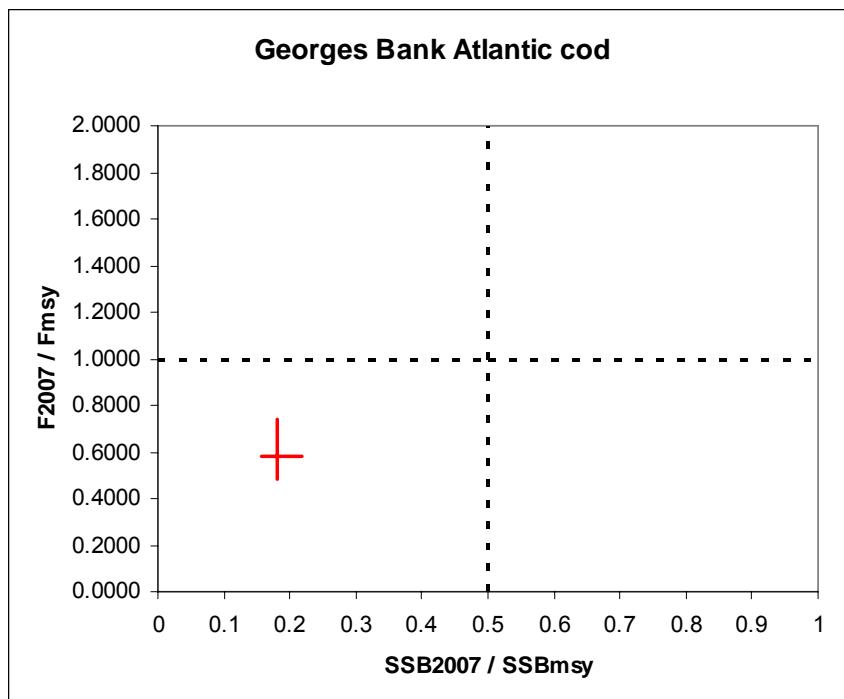


Figure A20. Status of 2007 fishing mortality (F) and spawning stock biomass (SSB) of Georges Bank Atlantic cod to F_{MSY} and SSB_{MSY} .